ATTACHMENT
F—2

ATTACHMENT F-2

INSPECTION SCHEDULE

ATTACHMENT F-2

HAZARDOUS WASTE INSPECTION SCHEDULE

ITEMS	TYPE OF PROBLEM	INSPECTION FREQUENCY
Container storage area	-Leaking drums -Drum bungs secure	Daily
Secondary containment area	-Presence of liquid -Cracks,joints	Weekly
Loading/Unloading area	-Obstructions -Presence of liquid	Daily (when in use)
Absorbent material	-Adequate supply	Weekly
Doors	-Open freely -Locks function	Daily
Fire extinguishers	-Available -Loss of pressure	Weekly
Self-contained breathing apparatus	-Loss of pressure in tank	Weekly
Respirator	-Available	Weekly
Eye wash station	-Solution available	Weekly
First aid kit	-Available -Adequate supplies	Weekly

ATTACHMENT
F—3

ATTACHMENT F-3

INSPECTION RECORDS

DETREX CORPORATION
GOLD SHIELD SOLVENTS
HAZARDOUS WASTE DAILY INSPECTION RECORD

WEEK OF: ____________

INSPECTION ITEM	TYPE OF PROBLEM	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
CONTAINER STORAGE AREA	-Leaking Drums -Drum Bungs Secure					
DOORS	-Open Freely -Locks Function					
LOADING/UNLOADING AREA	-Obstructions -Presence of Liquid					
COMMENTS CONCERNING POTENTIAL PROBLEMS						
	INSPECTED BY:					
	TIME:					

DETREX CORPORATION
GOLD SHIELD SOLVENTS
HAZARDOUS WASTE WEEKLY INSPECTION RECORD

INSPECTION ITEM	TYPE OF PROBLEM	COMMENT
SECONDARY CONTAINMENT AREA	-Presence of Liquid -Cracks and Joints	
ABSORBENT MATERIAL	-Adequate Supply	
FIRE EXTINGISHERS	-Available -Loss of Pressure	
SELF-CONTAINED BREATHING APPARATUS	-Loss of Pressure in Tank	
RESPIRATOR	-Available	
EYE WASH STATION	-Solution Available	
FIRST AID KIT	-Available -Adequate Supplies	

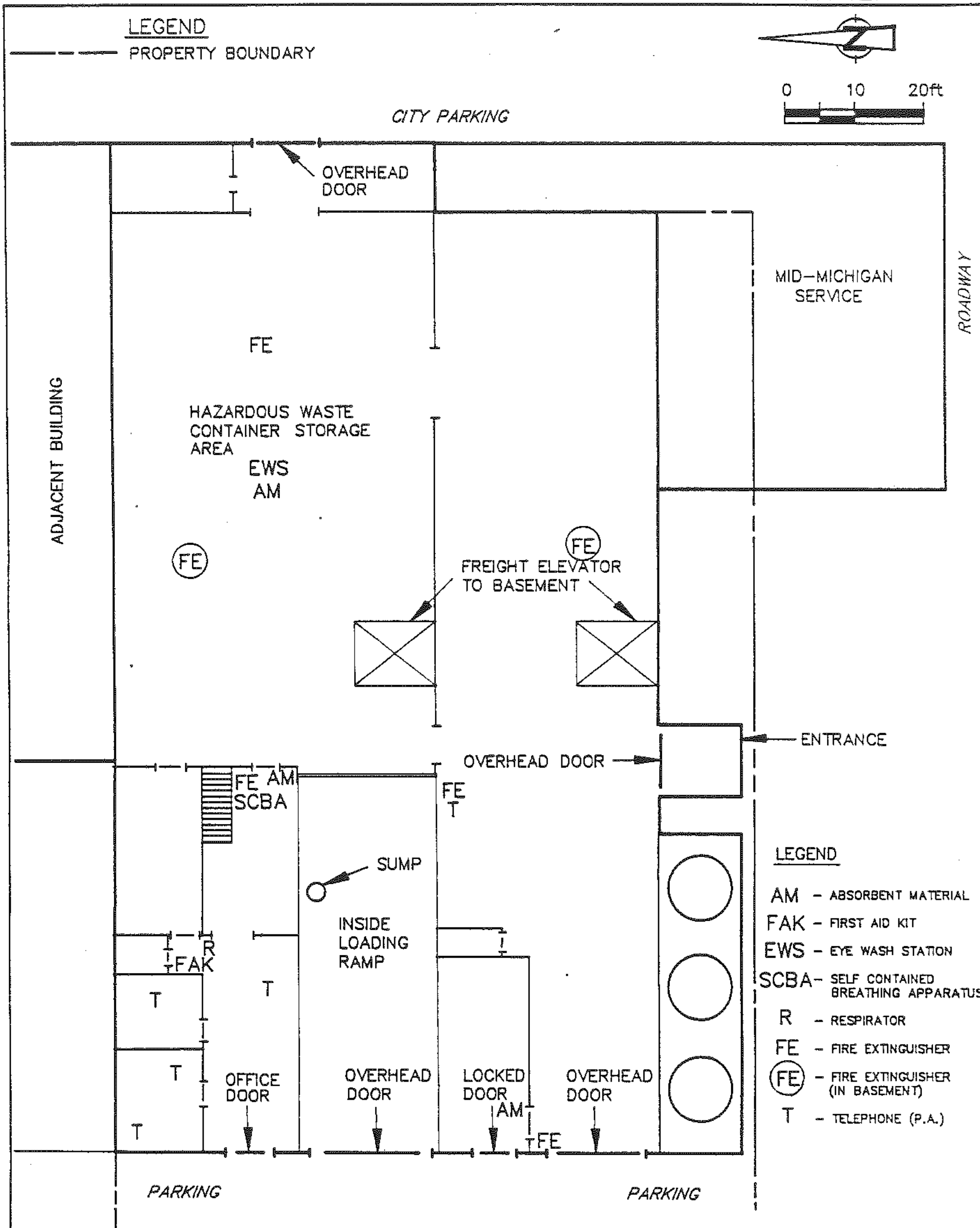
INSPECTED BY: ______________
DATE: ______________
TIME: ______________

ATTACHMENT
F—4

ATTACHMENT F-4

LOCATION OF EMERGENCY AND SAFETY EQUIPMENT

ATTACHMENT F-4



LOCATION OF EMERGENCY AND SAFETY EQUIPMENT

Detrex Corporation

Gold Shield Solvents, Grand Rapids

CRA

2471-26/10/88-6-D-6 (B-2)

G

SECTION G

CONTINGENCY PLAN

TABLE OF CONTENTS

Page

SECTION G
CONTINGENCY PLAN

LIST OF TABLES

LIST OF ATTACHMENTS

SECTION G

CONTINGENCY PLAN

This contingency plan has been prepared for the Detrex Corporation Gold Shield Solvents facility in Grand Rapids, Michigan. The contingency plan has been designed to minimize hazards to human health or the environment and describes the actions facility personnel will take in response to fires, explosions, or any unplanned sudden or nonsudden release of hazardous waste or hazardous waste constituents at the facility.

The information is provided pursuant to Michigan Act 64 Rule 299.9607 which incorporates 40 CFR Part 264 Subpart D by reference. The applicable section(s) of the Federal Regulations (40 CFR) is referenced as appropriate.

G-1 GENERAL INFORMATION [40 CFR §270.14(b)(7), Part 264, Subpart D

Detrex Corporation owns a solvent sales and storage operation, operated under the name Gold Shield Solvents in Grand Rapids, Michigan. The street location for the facility is:

Detrex Corporation
Gold Shield Solvents
312 Ellsworth Avenue, S.W.
Grand Rapids, Michigan 49503
Telephone: (616)454-9269

This facility is a warehouse for virgin halogenated hydrocarbon solvents and a hazardous waste container storage facility for spent solvents. The facility is classified as as treatment, storage, disposal (TSD) facility and operates under EPA identification number MID 020906764.

This contingency plan contains emergency provisions to minimize hazards to human health or the environment from fires, explosions, or any unplanned sudden or non-sudden release of hazardous waste or hazardous waste constituents.

G-2 EMERGENCY COORDINATORS [40 CFR §264.52(d) §264.55]

If an imminent or actual emergency is discovered, the Emergency Coordinator (either on the facility premises or on call) will be immediately notified. The primary Emergency Coordinator will be contacted first; if the primary Emergency Coordinator is not available, the alternate will be contacted. The primary Emergency Coordinator and the alternate are listed in Table G-1 with their job title, contact numbers and home addresses.

The employee who discovers an imminent or actual emergency shall take responsibility for notifying the Emergency Coordinator or alternative. At least one of the designated Emergency Coordinators will either be at the facility or on call and available to come to the facility, to respond to an emergency seven (7) days per week.

The Emergency Coordinator is thoroughly familiar with all aspects of the contingency plan, all operations and activities at the facility, the location and characteristics of wastes handled, the locations of all records within the facility, and the facility layout. The Emergency Coordinator has the authority to commit the resources necessary to implement the contingency plan. The Emergency Coordinator coordinates and directs all response efforts and personnel.

In the event that the Grand Rapids Fire Department (GRFD) responds to an emergency at the facility, the GRFD Supervisor assumes the duties and authorities of the Emergency Coordinator. The Supervisor and the Emergency Coordinator then act together to coordinate and direct the response effort. The plant Emergency Coordinator's principal authority is to effectively provide the GRFD Supervisor with comprehensive and detailed information concerning plant operations and the location and characteristics of materials handled.

A listing of the emergency response agencies and organizations which may be called upon to provide emergency assistance at the facility is provided in Table G-2 with their appropriate contact numbers.

At present, the local Police and Fire Departments and the local Hospital have a copy of the contingency plan.

TABLE G-1

EMERGENCY COORDINATORS

Name	Job Title	Work Phone	Home Phone	Home Address
Primary				
Sharon Burns	Facility Manager	(616) 454-9269	(616) 243-9966	1904 Newton, S.E. Grand Rapids, Michigan 49506
Alternates				
Mike Tepatti	Mid-West District Manager	(313) 358-5800	(313) 879-9485	6637 Northpointe Dr. Troy, Michigan 48098
Dan Anderson	Sales Representative	(616) 454-9269	(616) 329-4107	1715 Valley Wood Ct. No. 3 Portage, Michigan 49002

TABLE G-2

EMERGENCY RESPONSE AGENCIES/ORGANIZATIONS

Name	Phone Number
Police Department	911 (616-456-3405)
Fire Department	911 (616-456-3900)
Butterworth Hospital	(616) 774-1680
St. Mary's Hospital	(616) 774-6090
National Response Center	800-424-8802
Detrex Corporation Risk Management Group	(313) 358-5800
Michigan Pollution Emergency Alerting System	800-294-4706
State EPA	(616) 456-5071
Emergency Spill Clean-Up Companies - Mid-America	(616) 281-3090 (800) 382-2769
- A&B Industrial Services	(616) 375-9595

G-3 IMPLEMENTATION OF CONTINGENCY PLAN [40 CFR §264.52(a) §264.56(d)]

The provisions of this contingency plan must be carried out immediately whenever there is an imminent or actual incident, such as fire, explosion, or release of hazardous waste or hazardous waste constituents which could adversely threaten human health or the environment. Minor leaks or spills in the hazardous waste container storage area would not normally trigger the implementation of the Contingency Plan, but would be managed by the Emergency Coordinator or his alternate. This section of the Contingency Plan offers the Emergency Coordinator guidelines to evaluate the need to implement the Contingency Plan.

The contingency plan will be implemented in the following situations:

A. Fire and/or Explosion

1. A fire causes the release of toxic fumes.

2. The fire spreads and could possibly ignite materials at other locations on site or could cause heat-induced explosions.

3. The fire could possibly spread to off-site areas.

4. Contamination could spread from the use of water or water and chemical fire suppressants external to the facility.

5. An explosion has occurred or an imminent danger exists that an explosion could occur at the facility.

B. Spill or Material Release

1. The spill results in the release of toxic liquids representing a health hazard.

2. The spill is major (several drums) and could result in soil contamination and/or ground water pollution.

G-4 **EMERGENCY RESPONSE PROCEDURES** [40 CFR §264.56]

G-4a Notification/Identifications/Assessment/Reporting [40 CFR §264.56]

In the event of an emergency, the Emergency Coordinator or his alternate will be contacted immediately and will:

1) Determine the origin, location, nature and extent of the problem;

2) Establish a command post (at a designated location) from which to coordinate and direct the overall emergency response effort;

3) Inform other personnel of the situation;

4) If it is a localized situation, not involving sudden or non-sudden release, by fire, explosion or otherwise, of hazardous waste or hazardous waste constituents so as to threaten human health or the environment, handle the matter according to routine procedures; and

5) If it is an imminent or actual emergency, involving sudden or non-sudden release, by fire, explosion or otherwise so as to threaten human health or the environment, the Emergency Coordinator will immediately follow the following procedures:

Notification

1. Notify appropriate national, state, and/or local departments, agencies and organizations with designated response roles, including the Risk Management Group of Detrex Corporation (See Table G-2.)

2. When notifying response teams, the Emergency Coordinator should be prepared to furnish the following information:

   a) Name and telephone number of reporter:
   b) Name and address of facility:
   c) Time and type of incident (e.g. release, fire):
   d) Name and quantity of material(s) involved and to what extent:
   e) The extent of injuries if any, and:
   f) The possible hazards to human health, or the environment outside of the facility.

Identification

Identify the character, exact source, amount and areal extent of any released materials. This may be accomplished by observation or review of facility records or manifests, and, if necessary, by chemical analysis.

Assessment

Assess possible hazards to human health or the environment that may result from the release, fire, or explosion. This assessment shall consider both direct and indirect effects of the release, fire, or explosion, including the effects of any toxic, irritating, or asphyxiating gases that are generated, or the effects of any hazardous surface water runoff from water or chemical agents used to control fire and heat-induced explosions.

The procedure for assessing possible hazards includes:

1. Identification of hazardous properties of the materials involved or by-products thereor.

2. Determination of threat to human health or the environment, both on site and off site.

3. Assess any environmental conditions (e.g. windspeed and direction) that may contribute to the seriousness of the hazard.

4. Determine the readiness and availability of response equipment, both on site and off site.

Specific Assessment of Possible Hazards to Human Health or the Environment

1. Emergencies which result in a spill or release of hazardous material which cannot be controlled by plant employees but will be contained by the secondary containment system shall not be deemed a hazard to human health or the environment.

2. Emergencies which result in a spill or release of hazardous material which cannot be controlled by plant employees or the secondary containment system but does not reach storm drains or enter aquifers which are used for human consumption shall be considered a hazard to the environment but not necessarily to human health.

3. Emergencies which satisfy the criteria in 2 above and may possibly reach storm drains or aquifers which are used for human consumption shall be considered a hazard to the environment and to human health.

Reporting

If the Emergency Coordinator determines that the release, fire, or explosion could threaten human health or the environment outside the boundaries of the facility, he shall:

1) If his assessment of the emergency indicates that evacuation of the surrounding local areas may be advisable, immediately notify the Grand Rapids Fire Department at 911.

2) Immediately contact all other appropriate departments, agencies and organizations with designated response orders and relate to them the specific information they require to respond (see Notification).

G-4b Control Procedures [40 CFR §264.52(a)]

Potential accidents are classified into two general areas:

1) Fire and/or explosion involving hazardous waste or hazardous waste constituents; and

2) Accidental release in a liquid form of hazardous waste or hazardous waste constituent.

G-4b(1) Fire and/or Explosion

The hazardous waste container storage area is accessible by fire-fighting and other emergency equipment. Response procedures in the event of a fire and/or explosion will be as follows:

1) Plant personnel will notify the office via telephone or by personal communication.

2) The Emergency Coordinator will be notified.

3) If a fire is minor, facility fire-fighting equipment such as fire extinguishers would be used, to extinguish the fire.

4) If a fire and/or explosion is major, the local fire department will be contacted at 911.

5) Any operating units such as boilers, air conditioners, heating systems, fans, etc., would be shut down immediately.

6) In the event that Step 3 fails to control the fire, Steps 4 and 5 will be implemented and all employees will immediately vacate the premise. Personnel will meet and be accounted for in front of the facility.

7) The Emergency Coordinator has the authority to direct other necessary actions as required.

8) An "all clear" signal will be given by the Emergency Coordinator when the fire and/or explosion has been extinguished and the personnel's safety is no longer endangered.

9) After a fire and/or explosion has been extinguished, clean-up procedures will commence. All emergency equipment used must be replaced, repaired, recharged or otherwise be in good operating condition and placed in the appropriate location before normal operations resume.

G-4b(2) Accidental Release, Liquid

If an accidental release of liquid occurs which cannot be controlled with absorbent material, the following steps will be taken:

1) Plant personnel will notify the office via telephone or by personal communication.

2) The Emergency Coordinator will be notified.

3) The exact source and type of release of hazardous waste or hazardous waste constituent will be determined.

4) All pump(s) contributing to the release will be shut off.

5) Any section(s) of pipe contributing to the release will be isolated by closing the appropriate valves.

6) If the discharge is from a drum, the drum will be turned to orient the leak towards the top.

7) A temporary dike of absorbent material will be placed around the discharge area.

8) All doors to the outside will be opened.

9) Plant personnel will be evacuated from building, if deemed necessary. Personnel will meet and be accounted for in front of the facility.

10) Clean-up procedures, which may include notification of a spill clean-up firm, furnishing the clean-up crew with physical and/or chemical properties of waste and amount of waste released, shall be implemented.

    a) Clean-up of released waste from containers: The waste will be collected via use of absorbent material for small spills. The contaminated material will then be placed in open-top steel drums and transported off site for treatment/disposal at a permitted facility. For large spills, the waste will be collected with a pump and placed in steel drums for reclamation in Detroit. The balance shall be cleaned up with absorbent material as stated above.

    b) Decontamination: Following cleanup with absorbent material, the affected area of the secondary containment area will be swept and all sweepings will be drummed. The pad may be subsequently decontaminated by steam cleaning. Any wash waters generated will be collected in drums and transported off site for treatment/disposal at a permitted facility.

    c) Cleanup of Contamination Soil: Should the spill or release occur outside the secondary containment area (i.e. external to the building), cleanup will be accomplished by a firm specializing in such procedures. All visually contaminated soils, where practical, will be excavated and disposed as appropriate, at a permitted hazardous waste facility. Any excavations may be restricted by building foundations.

11) Emergency equipment used, must be replaced, repaired, recharged or otherwise be in good operating condition and placed in the appropriate location before operations resume.

G-4c PREVENTION OF RECURRENCE OR SPREAD OF FIRES, EXPLOSIONS OR RELEASES [40 CFR§264.56(e)]

Actions to prevent the recurrence or spread of fires, explosions or releases may include:

1) Halting operations.

2) Collecting and containing released wastes.

3) Prohibiting smoking in all areas except designated smoking areas.

4) Using non-sparking tools.

5) Protecting the area from open flame or heat generating activities.

All reasonable safety procedures will be followed prior to resuming operations.

G-4d STORAGE AND TREATMENT OF RELEASED MATERIAL [40 CFR§264.56(g)]

Immediately after an emergency, the Emergency Coordinator will make arrangements for proper treatment, storage and/or disposal of all water and contaminated materials resulting from the release, fire or explosion. All resulting wastes generated will be considered a RCRA hazardous waste and managed as a RCRA waste unless it can be demonstrated to be non-regulated.

G-4e INCOMPATIBLE WASTES [40 CFR§264.56(h)(1)]

The Emergency Coordinator will insure that wastes, which may be incompatible with the released material, are treated, stored, or disposed until cleanup procedures are completed.

G-4f POST-EMERGENCY EQUIPMENT MAINTENANCE [40 CFR§264.56(h)(2)]

After an emergency event, or as required during the emergency response, all emergency equipment utilized in the affected area will be cleaned, or replaced, so that they are suitable for future use. Prior to resuming operations, an inspection of all utilized safety equipment will be conducted. All proper authorities will be notified that the post-emergency equipment maintenance has been performed and operations will resume.

G-4g Container Spills and Leakage [40 CFR §264.52, §264.171]

The procedures to be implemented when responding to a spill or leak from a container were described in Section G-4b(2), previously.

G-4h Tank Spills and Leakage [40 CFR §264.194(c)]

There are no hazardous waste storage tanks at the Gold Shield Solvents facility in Grand Rapids, Michigan.

G-4i Waste Pile Spills and Leakage [40 CFR §264.252 and .253]

There are no waste piles at the Gold Shield Solvents facility in Grand Rapids, Michigan.

G-4j Surface Impoundment Spills and Leakage [40 CFR §264.222 and .227]

There are no surface impoundments at the Gold Shield Solvents facility in Grand Rapids, Michigan.

G-4k Incineration Spills and Leakage [40 CFR §264.52]

There are no incinereators at the Gold Shield Solvents facility in Grand Rapids, Michigan.

G-4l Landfill Leakage [40 CFR §264.52, §264.302(b)]

There are no landfills at the Gold Shield Solvents facility in Grand Rapids, Michigan.

G-4m Land Treatment Facility Spills and Leakage [40 CFR §264.52)(a)]

There are no land treatment facilities at the Gold Shield Solvents facility in Grand Rapids, Michigan.

G-5 EMERGENCY EQUIPMENT [40 CFR §264.52(e)]

The type and physical location of Gold Shield Solvents' emergency equipment, including fire equipment, spill control equipment breathing apparatus and medical treatment facilities is presented in Attachment G-2. A brief discussion of each aspect of the Emergency Equipment follows.

1) Communications System

- telephone/public address system

2) Fire Control Systems and Equipment

- fire extinguishers
- fire hydrants

3) Spill Control Equipment

- absorbent material

4) Health and Medical Emergency Equipment/Supplies

- respirators
- self-contained breathing apparatus
- eye wash
- first-aid
- safety goggles
- gloves

G-6 COORDINATION AGREEMENTS [40 CFR §264.37/§264.52(c)]

To familiarize police, fire department and hospital officials with the layout of the facility, properties of the hazardous wastes handled at the facility and associated hazards, entrances to the facility, possible evacuation routes, and other aspects of the Gold Shield Solvents facility, copies of the contingency plan have been submitted to the appropriate officials.

Each person, or the chief officer of each department, which received a copy of the contingency plan was asked to sign a Coordination Agreement form to acknowledge that he/she reviewed the plan, understood the department's role under the plan, and that all members of the department will be informed of the plan's content and their individual responsibilities. Signed agreements are maintained on file in the office.

G-7 EVACUATION PLAN [40 CFR §264.52(f)]

If an emergency occurs which cannot be adequately responded to by plant personnel, the Emergency Coordinator will signal employees by way of facility public address system or by personal communication to evacuate the facility. Employees will exit the facility by the most expeditious route (see evacuations routes in Attachment G-3). Once outside the building, employees will meet in front of the facility on Ellsworth Avenue to be accounted for. The Emergency Coordinator will then notify the proper emergency response teams. The Emergency Coordinator, based on this assessment, may deviate from established procedures in order to effectively and safely respond to emergency situations.

G-8 REQUIRED REPORTS [40 CFR §264.56(j)]

As required, any emergency event requiring implementation of the contingency plan will be reported in writing to the MDNR Director within fifteen (15) days of the event. This report will, at minimum, contain:

1) Name, address, and telephone number of the owner or operator;

2) Name, address, and telephone number of the owner or facility;

3) Date, time, and type of incident (ie. fire, explosion);

4) Name and quantity of materials involved;

5) The extent of injuries, if any;

6) The assessment of actual or potential hazards to human health or the environment, where this is applicable; and

7) Estimated quantity and disposition of recovered material that resulted from the incident.

It will be the responsibility of The Risk Management Group of Detrex Corporation to submit reports to the appropriate agencies and to retain on file all applicable information in the event that the contingency plan was implemented.

The Risk Management Group of Detrex will also inform the appropriate departments, agencies and authorities that clean-up is complete before operations at the facility resume.

G-9 AMENDMENTS TO THE CONTINGENCY PLAN [40 CFR §264.54]

The contingency plan will be reviewed and immediately amended, if necessary, whenever:

1) the facility permit is revised

2) the plan fails in an emergency

3) the list of emergency coordinators changes

4) the list of emergency equipment changes

5) the facility alters its design, construction, operation, maintenance, or other circumstances in a way materially increasing the potential for fires, explosions or releases of hazardous waste/or hazardous waste constituents

6) the actions/responses necessary to comply in an emergency situation change

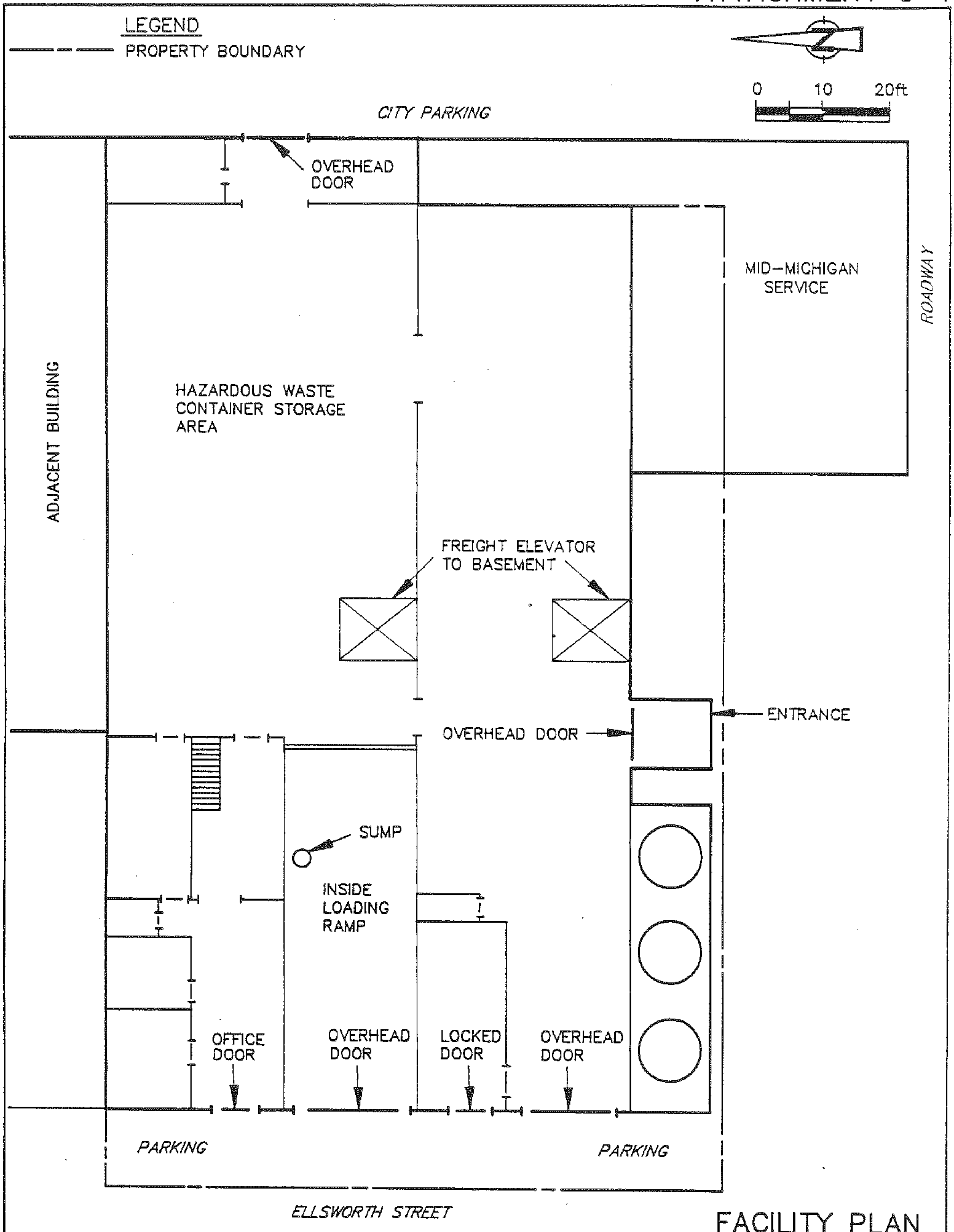
All changes in this plan will be sent to every person, agency, department and organization on the contingency plan distribution list within 30 days of the effective date of the change.

ATTACHMENT G—1

ATTACHMENT G-1

FACILITY PLAN

ATTACHMENT G-1



FACILITY PLAN
Detrex Corporation
Gold Shield Solvents, Grand Rapids

CRA

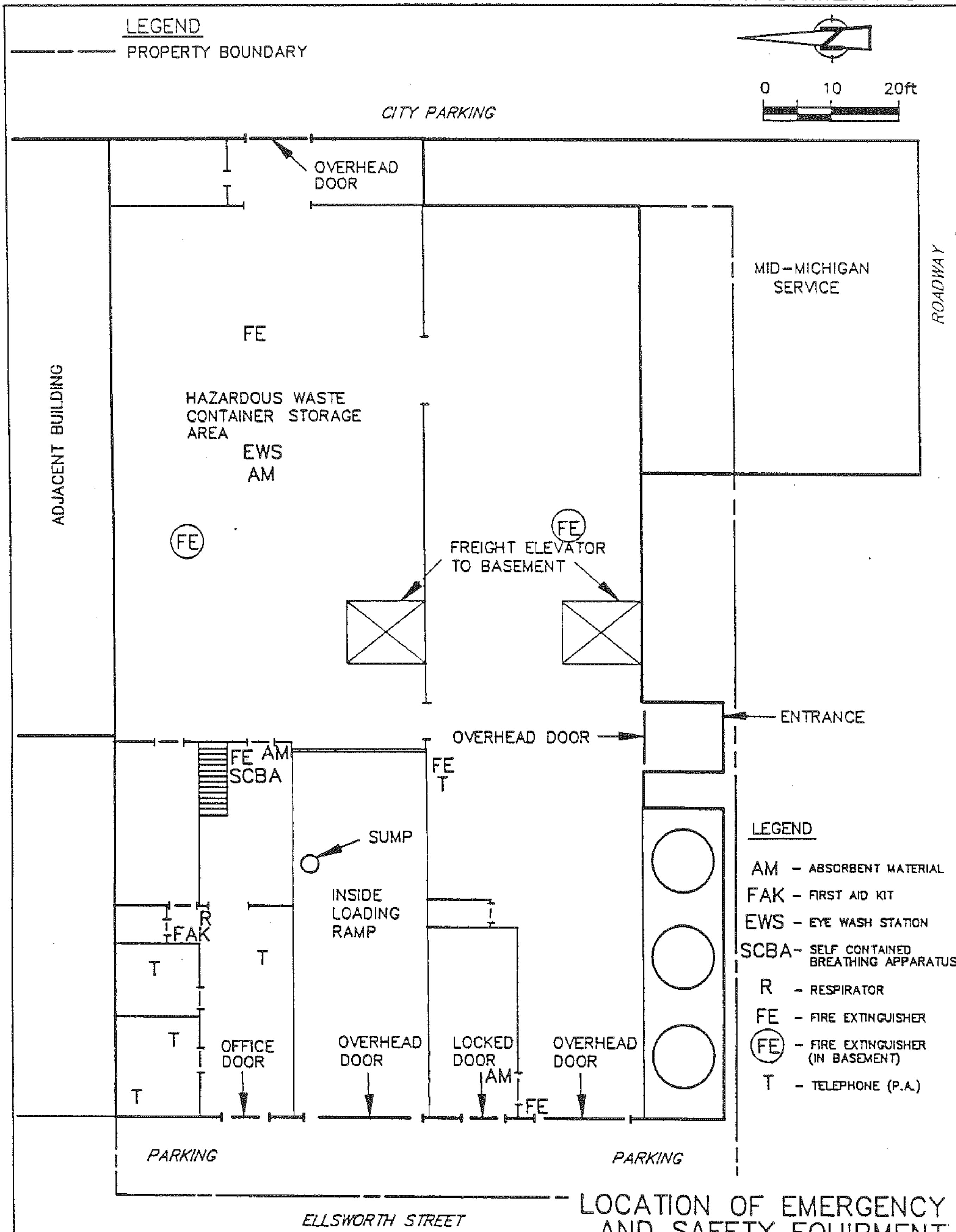
2471-4/11/88-6-D-0

ATTACHMENT
G—2

ATTACHMENT G-2

LOCATION OF EMERGENCY AND SAFETY EQUIPMENT

ATTACHMENT G-2



LOCATION OF EMERGENCY AND SAFETY EQUIPMENT

Detrex Corporation

Gold Shield Solvents, Grand Rapids

CRA

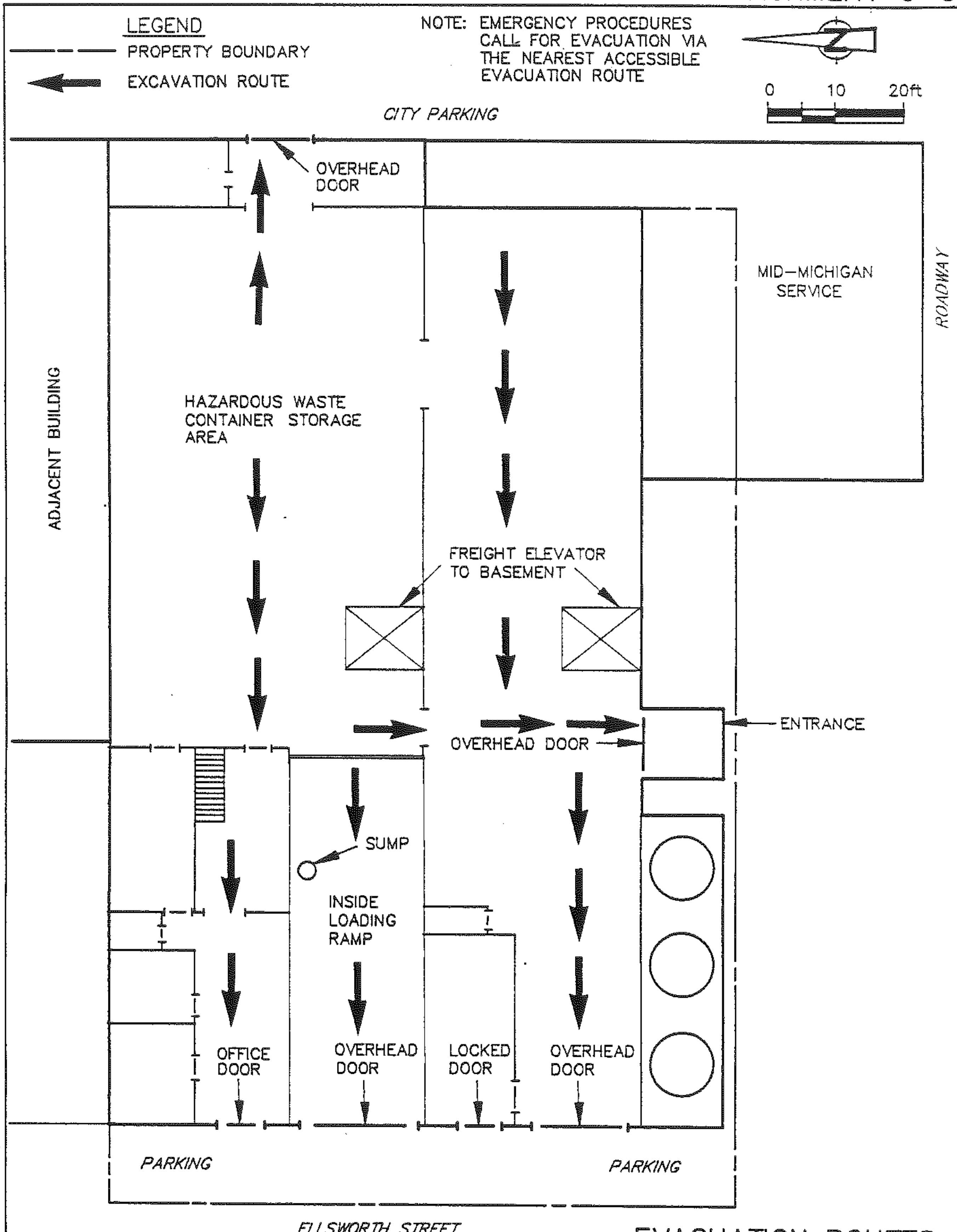
2471-26/10/88-6-D-6 (B-2)

ATTACHMENT G—3

ATTACHMENT G-3

EVACUATION ROUTES

ATTACHMENT G-3



EVACUATION ROUTES
Detrex Corporation
Gold Shield Solvents, Grand Rapids

CRA

2471–4/11/88–6–D–0

H

SECTION H

PERSONNEL TRAINING

TABLE OF CONTENTS

LIST OF ATTACHMENTS

SECTION H

PERSONNEL TRAINING

This section outlines the personnel training program completed by all employees of Detrex Corporations' Gold Shield Solvents facility in Grand Rapids, Michigan. The information is provided pursuant to Michigan Act 64 Rule 299.9504(1)(c) which incorporates 40 CFR 270.14(b)(12) and 264.16 by reference. The applicable section(s) of the Federal Regulations (40 CFR) is referenced as appropriate.

H-1 OUTLINE OF TRAINING PROGRAM [40 CFR §264.16(a)(1)]

H-1a Job Titles/Job Description [40 CFR §264.16(d),(1) and (2)]

Gold Shield Solvents maintains the following documents and records at the facility:

1) The job title for each position related to hazardous waste management, and the name of the employee currently filling each job.

2) The written job description for each position as described in (1) above, which includes experience, skills and responsibilities. Job descriptions, a copy of which are provided in Attachment H-1, are kept on file in the plant office.

3) A written description of the type and amount of both introductory and continuing training given to personnel for each position related to hazardous waste management.

4) Records that document that the training and job experience have been completed by facility personnel.

Gold Shield Solvents maintain training records of former employees involved with hazardous waste management for three years from the date they last worked at the facility and will maintain training records on current personnel until closure of the facility.

H-1b Training Content, Frequency, and Technique [40 CFR §264.16(c), and (d)(3)]

The program developed by Detrex Corporation for training employees in the safe handling of hazardous wastes includes study, on-the-job training, and competence evaluation. Provisions are made for updating or revising the training program as necessary to ensure compliance with regulatory guidelines, changing facility conditions, and organizational changes.

A copy of the Hazardous Waste Management Facility Employee Training Program Manual developed by Detrex is provided in Attachment H-2. This outlines all aspects of the training program, providing each employee with the information required for the safe execution of his or her responsibilities.

H-1c <u>Training Director</u> [40 CFR §264.16(a)(2)]

The personnel training program is directed by the Emergency Coordinator. The Emergency Coordinator has been trained in all aspects of Hazardous Waste Management Procedures.

H-1d <u>Relevance of Training to Job Position [40 CFR §264.16(a)(2)]</u>

Contents of the training program is tailored to each position.

The Warehouseman receives training in the operation of: Safety Equipment, Emergency Equipment, and Forklift and Hand Truck Operation.

The Truck Operator receives training in the operation of: Safety Equipment, Emergency Equipment and Transportation and Material Handling Equipment.

The Facility Manager/Emergency Coordinator receives training in the Operation, Inspection and Recordkeeping for: Manifesting of Hazardous Waste Shipments, Inventory, Safety Equipment, Transportation and Material Handling Equipment and Contingency Plan Procedures.

The Sales Representative receives training Record Keeping, Safety Equipment, Emergency Equipment, Material Handling Equipment and Contingency Plan Procedures.

H-1e <u>Training for Emergency Response [40 CFR §264.16(a)(3)]</u>

This training program is designed to ensure that personnel not only handle hazardous wastes in a safe manner, but also properly respond to emergency situations. The program trains hazardous waste handling/management personnel to maintain compliance under both normal operating conditions and emergency conditions.

H-2 IMPLEMENTATION OF TRAINING PROGRAM [40 CFR §264.16(b), and (d)(4)]

An employee is hired to fill a specific position (i.e. Warehousemen). The employee is first required to review the written training program for the position he/she is to fill. Upon completion, the employee is then given 40 hours of on-the-job training within 1 month of hiring.

No employee hired to work at this facility will work unsupervised in tasks related to hazardous waste management prior to completion of the training program.

Employees are required to meet annually for reviews and updates of this training program and to discuss and study the following subjects:

1. All hazardous wastes currently being handled at the facility, noting only changes in waste type, volume, source, characteristics, or location that have occurred during the past year;

2. The status of operating conditions and procedures, noting any areas where there are problems or potential for problems. Employees participate in developing effective solutions;

3. The requirements contained in the facility's operating license, noting any changes that have occurred during the past year. Areas where maintenance or compliance is a problem are identified and discussed, and effective solutions are sought; and

4. Incidents that have occurred in the past year that warranted use of contingency plans and/or emergency action. This review focuses on the cause of the incident and identification of steps to be taken to prevent or to ensure better handling of such events in the future.

Records documenting that the required training or job experience required to ensure that employees are trained to perform their duties in such a manner that compliance with the operating license is assured, will be kept onsite in the office. These records will be kept until closure of the facility for current employees and for 3 years from the date of the individual employee's termination for former employees. Records will include job description, employee name, training contents, date and duration of training and the instructor assessment of competency.

ATTACHMENT H—1

ATTACHMENT H-1

JOB DESCRIPTIONS

Date: 11/08/88
Revision: 88-0
Attachment: H-1

TITLE: FACILITY MANAGER

1. Total administrative duties relating to employee supervision and office management including:

   a. Does billing.

   b. Keeps records of accounts payable and receivable.

   c. Does mailing and correspondence.

   d. Schedules delivery runs.

   e. Fills out shipping forms, keeps records of shipping and receiving.

   f. Answers phones and processes paperwork on orders.

2. Total office, warehouse, tank farm and truck equipment maintenance programs and implementation of such programs.

3. Hazardous waste management.

   a. Perform duties of Branch Emergency Coordinator.

   b. Completes and keeps records of hazardous waste manifests.

   c. Responsible for inventory control.

   d. Supervises hazardous waste drum sampling and testing if done on premises.

   e. Maintains records of incoming and outgoing hazardous wastes.

   f. Supervises record keeping of all daily and weekly facility inspection reports.

   g. Contact for all regulatory agency personnel and Detrex Risk Management.

Date: 11/08/88
Revision: 88-0
Attachment: H-1

TITLE: WAREHOUSEMAN

1. Drums and labels all new material for shipment to customers.

2. Performs minor maintenance on facility equipment.

3. Notifies office when material and/or services are required.

4. Hazardous Waste Management:

    a. Stores containers of hazardous waste in designated areas of the warehouse.

    b. Samples incoming hazardous waste.

    c. Checks manifests for incoming waste for accuracy.

    d. Performs daily and weekly facility inspections and maintains records of such inspections.

5. Is knowledgeable on operation of all safety equipment, SCBA, respirators, intercom, etc.

Date: 11/08/88
Revision: 88-0
Attachment: H-1

TITLE: TRUCK OPERATOR

When operating a Gold Shield Solvents Truck

1. Knowledge:

   a. Full knowledge of streets in the City of Grand Rapids and suburbs.

   b. Common knowledge of the mechanical operations of a truck.

   c. Must have a valid chauffeur's license and abide by governmental rules and regulations.

   d. Must know the mechanical condition of the truck and report any defects.

   e. Must pass DOT oral and written tests which will be scored by an impartial party.

   f. Must pass DOT physical.

   g. Must have respectable driving record. The Company's Risk Management Group will review the driving record of truck driver applicants. Their decision to reject an applicant based on a poor driving record will be considered final and binding.

   h. Must pass a driving test on Detrex equipment which will be evaluated by an impartial party.

   i. Chauffeur's license must be C-2 or better.

   j. Will have successfully completed training at one of the State of Michigan Community Development Programs, specifically Hazardous Waste Industry Training and technical assistance programs.

   k. Will have successfully completed driver testing and have been certified by Risk Management as outlined in the Code of Federal Regulations, part 49, section 390-392.

2. Performance:

   a. Must be capable of driving any facility automotive equipment owned by Detrex.

b. Load and unload or assist in the loading and unloading of the truck.

c. Will make bulk deliveries using (1) tank truck, (2) tank trailer, as required.

d. Will maintain all necessary log books when required as outlined in the Code of Federal Regulations, part 49, section 395.

e. Will make Hazardous Waste pickups using stake trailer, as required and according to Federal and State laws.

3. Responsibility:

a. Responsible for the quality of workmanship.

b. Exercise due care of the various pieces of equipment while operating same.

c. Must operate the equipment in a safe manner. Keep the equipment and the area wherein the work is performed tidy at all times.

d. Responsible for implementing the transporters contingency plan in case of accidental spill of hazardous waste.

e. Responsible to see that hazardous waste labels on drums are filled out properly and include the proper UN/NA numbers according to DOT regulations.

f. Responsible for signing hazardous waste manifest on behalf of the Company that all information on manifest is correct and accurate.

Date: 11/08/88
Revision: 88-0
Attachment: H-1

TITLE: SALES REPRESENTATIVE

1. Perform duties of Alternate Emergency Coordinator.

2. Total sales administrative duties and direct sales customer calls and related functions.

3. Assumes administrative duties of Facility Manager in the case of his/her absence.

ATTACHMENT
H—2

ATTACHMENT H-2

EMPLOYEE TRAINING PROGRAM

Date: 11/08/88
Revision: 88-0
Attachment: H-2

TRAINING PROGRAM

OVERVIEW

This facility primarily conducts on-the-job training programs. All new employees are familiarized with general/specific chemical hazards and instructed to perform their assigned tasks in a safe, efficient manner. Additional safety/product information is presented on a continual basis.

This facility operates essentially without detailed written job descriptions relying on a "standard operating procedures" approach. Employees are instructed/prepared for their assignments on a supervised, individual basis.

1. Job Titles and Duties

(a) Job Titles

An organization chart is presented for this storage and sales facility in Appendix 1. The titles of the personnel involved with hazardous waste management are:

Titles

Facility Manager
Truck Operator
Warehouseman
Sales Representative

Maintenance is performed by hourly employees trained to properly handle hazardous wastes.

(b) Duties

Gold Shield Solvents does not utilize detailed job descriptions for hourly employees or salaried sales employees. Rather, employees are assigned tasks similar to a given job title and are expected to perform those tasks in a safe and orderly fashion. The majority of training is "hands-on" the job directly related to an assigned position.

The written job description for the personnel involved with hazardous waste management are maintained at the facility as well as a list of the current personnel filing each job.

2. Training Content, Frequency and Techniques

(a) Training Content

Gold Shield Solvents' employee training regarding the safe handling of hazardous wastes is initiated during the first week of employment. This orientation includes the following:

Attachment	Description
Appendix 2	Clerical-Technical Orientation Checklist (is applicable)
Appendix 3	Hourly Orientation Checklist (if applicable)
Appendix 4	"What To Do If You Get Chemicals Spilled On Various Part Of Your Body"

Additionally, the training program addresses as a minimum the following topics:

1. Contingency plan for assigned facility.
2. Information on hazardous materials and their potential hazards.
3. Internal and external communications.
4. Personnel safety equipment.
5. Respiratory equipment including fit-testing.
6. Decontamination procedures in case of material spill/release.
7. Evacuation, first aid and emergency procedures dealing with fire and medical situations, including hands-on training in the proper use of fire extinguishers and foam.

8. Safe work practices associated with employee's work assignment.

New employees are supervised until they are deemed competent by the branch manager for their assigned tanks.

As part of this program, employees are provided with a variety of written material. New employees receive copies of Section G (Contingency Plan) and appropriate portions of Section H (Personnel Training). Annual review contain information regarding regulatory changes, any implementations of the facility's contingency plan in the past year, and any changes in the facility's operating permit. In addition, employees' questions and opinions are solicited and employees are, in turn, questioned to insure their comprehension.

Procedures for responding to emergencies are presented to employees on a general and a specific basis. As previously described, each employee receives, among other documents and training, a copy of the facility's contingency plan, as well as information regarding the type and location of emergency and communication equipment. This emergency equipment is inspected on a regular basis (see schedules and inspection forms contained in Section F).

Persons responsible for operation of the hazardous waste drums storage area are trained in the proper storage requirements to avoid potential hazards, which are described more fully in Section F of this permit applications.

In the event of an emergency such as an explosure or fire, the specific procedures set forth in the contingency plan (with which employees are familiar through the training program) would govern. Documentation of this training program is maintained in the form of sheets signed by affected employees upon completion of the training session. These sheets are maintained with the facility's operating record.

(b) <u>Frequency</u>

The employee training program, as described in this document, is undertaken by all employees immediately upon their hiring by the facility.

In addition, all employees are required to meet, at a minimum, annually for reviews and updates of the training program. These reviews cover any and all changes in the operational or response procedures at the facility, past incidents that have cause the implementation of the contingency plan, and any changes to the operating permit and/or Federal and State regulations that require an alternation to existing operational procedures.

(c) Techniques

Gold Shield Solvents utilizes the plant environment for all employees orientation and on-the-job training.

3. Training Direction and Implementation

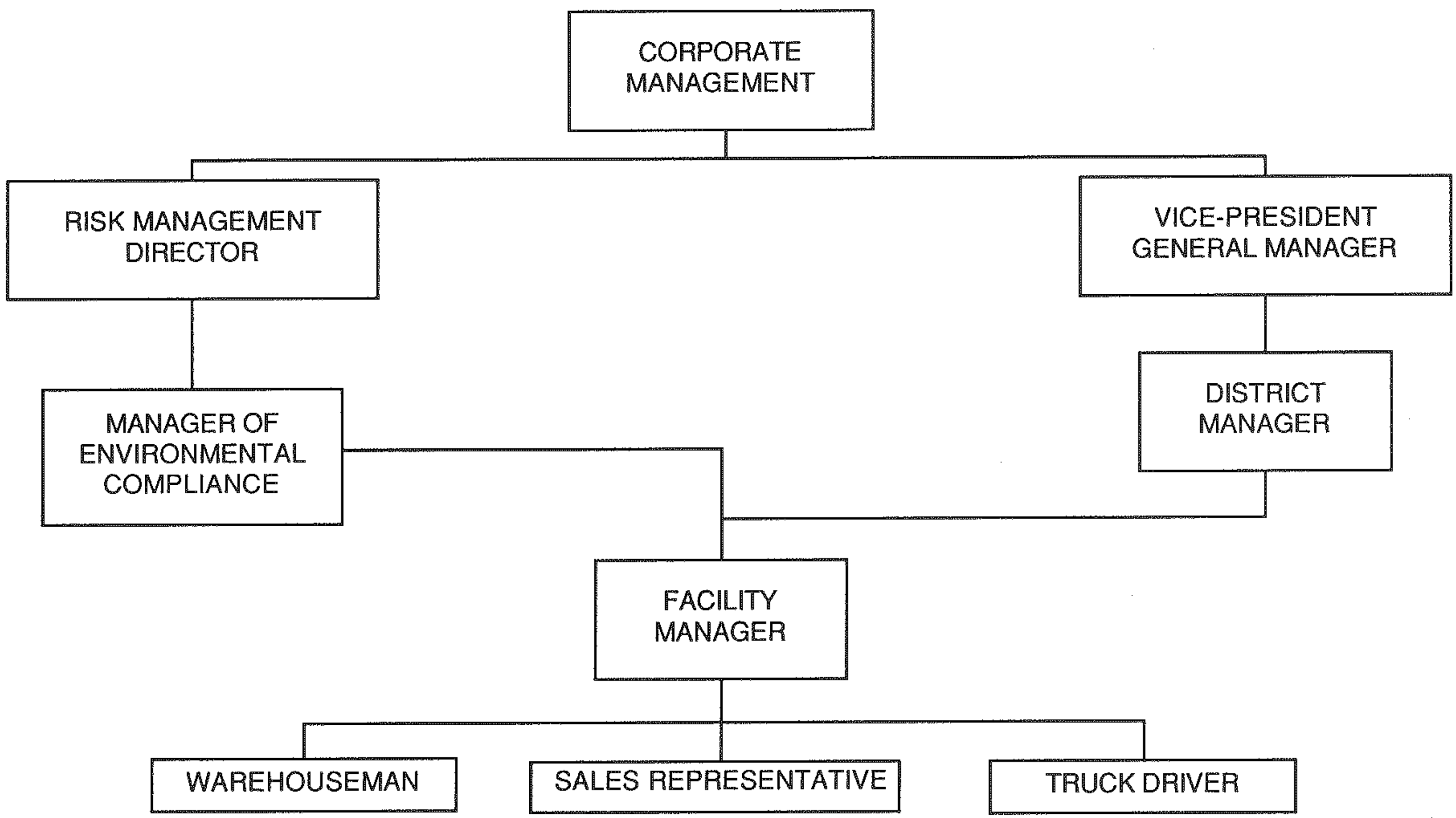
All employees involved with hazardous waste management are training by the facility Emergency Coordinator. All new personnel assigned to hazardous waste management tasks will complete the in-house training program within one (1) month of assignment to any hazardous waste management position. Employees will not perform assigned tasks unsupervised until training is complete.

Employees are required to meet annually for review/update of this training program. Their active participation is sought to maintain a valid program.

LIST OF APPENDICES

APPENDIX 1

ORGANIZATIONAL CHART



Appendix 1

ORGANIZATIONAL CHART

DETREX CORPORATION GOLD SHIELD SOLVENTS

GRAND RAPIDS, MICHIGAN

APPENDIX 2

CLERICAL-TECHNICAL ORIENTATION CHECKLIST

CLERICAL-TECHNICAL ORIENTATION CHECKLIST

Items to Cover	Key Points to Cover	Who Should Cover	When	Item Covered Initial	Item Covered Date
Positive Attitude	- Assure employee that your role is to help him in his new job and that he should come to you for information and assistance.	Supervisor	First Day		
Salary	- Advise employee of his starting salary and the job rate. - Explain that employee's performance will be reviewed periodically and, if satisfactory, his salary will be increased until the job rate is attained. If progress is not satisfactory, the employee will be told the reason and salary increases will be withheld until satisfactory performance is reached. - Inform employee of periodic adjustments in the salary ranges to keep salaries comparable with other area employers. - Explain overtime payment provisions.	Supervisor	First Day		
Shop Rules of Conduct and Work Practices	- Give copy to employee. - Review each item with employee. - Stress importance of regular attendance and advance notice to the supervisor if absence is unavoidable. - Explain requirement to work reasonable overtime. - Instruct employee in the proper use and safeguarding of vehicles, tools and equipment.	Supervisor	First Week		
Community "Right to Know"	- Discuss the contents of the manual, particularly the valuable source of specific toxic substance information in the Material Safety Data Sheet binders. - Review each item with the employee.	Supervisor	First Week		
Safety	- Explain Detrex's objective of production with no injuries, that all injuries can be prevented and that employee is to report any unsafe conditions and all injuries promptly to you. - Discuss fire and emergency procedures, including location of first aid facilities, fire extinguishers, etc. - Send employee to see the Emergency Coordinator for detailed instructions if the employee's job is potentially hazardous.	Supervisor and Emergency Coordinator	First Day		

CLERICAL-TECHNICAL ORIENTATION CHECKLIST

Items to Cover	Key Points to Cover	Who Should Cover	When	Item Covered: Initial	Date
Equal Employment Opportunity	- Inform employee that Detrex does not discriminate and that Detrex bases clerical-technical personnel decisions on merit, qualifications, service and business needs.	Supervisor	First Week		
Company Background	- Explain corporate operations, the number and location of facilities, the number of employees, etc.	Supervisor	First Week		
Benefits	- Give employee a copy of "Employee Benefits Booklet". - Review the highlights of each plan, including the eligibility date, summary of the coverage, what the employee pays and what the Company pays.	Supervisor	First Week		
Pollution Control	- Explain that Detrex must meet Federal and State laws and regulations pertaining to air, water and land purity. - Point out that the improper handling and disposition of chemicals can pollute the air, water and land and can have adverse impact on Detrex and on Detrex's employees. - Review the required actions to minimize pollution in the plant. - Give employee a copy of the <u>Annual Training and Orientation Checklist for Employees Regarding Hazardous Wastes</u>. Discuss the contents, specifically Detrex's intent to protect our environment through proper handling of hazardous wastes.	Supervisor	First Week		
Energy Conservation	- Point out that Detrex's energy costs, like the employees, are constantly increasing and that Detrex welcomes any suggestions to reduce these energy costs. - Emphasize the need to conserve energy; e.g. heat, light, etc.	Supervisor	First Week		
Employee Confidential and Proprietary Information Agreement	- Have employee read the entire Agreement and sign and return to the Supervisor the Employee's Agreement Form.	Supervisor	First Week		

CLERICAL-TECHNICAL ORIENTATION CHECKLIST

Items to Cover	Key Points to Cover	Who Should Cover	When	Item Covered Initial	Item Covered Date
Acknowledgement of Orientation	- By signing below, the employee acknowledges that his supervisor and Personnel have covered the items listed above and that he intends to comply with the rules contained therein.	Supervisor	Second Week		

Employee's Signature ____________________ Date ____________

Supervisor's Signature ____________________ Date ____________

Personnel's Signature ____________________ Date ____________

* Wherever his, him or he are used, the terms are meant to cover male and female.

DISTRIBUTION: Original for employee's personnel folder in Payroll
Copy for employee's on-site personnel folder
Copy for employee

APPENDIX 3

HOURLY ORIENTATION CHECKLIST

HOURLY ORIENTATION CHECKLIST

Items to Cover	Key Points to Cover	Who Should Cover	When	Item Covered Initial	Item Covered Date
Positive Attitude	- Assure employee that your role is to help him in his new job and that he should come to you for information and assistance.	Supervisor	First Day		
Salary	- Advise employee of his starting salary and the job rate. - Explain the timing and amount of progression increases and that progression increases will be withheld for unsatisfactory performance. - Inform employee of scheduled general and cost of living increases. - Explain overtime payment provisions.	Supervisor	First Day		
Shop Rules of Conduct and Work Practices	- Give copy to employee. - Review each item with employee. - Stress importance of regular attendance and advance notice to the supervisor if absence is unavoidable. - Explain requirement to work reasonable overtime and on any shift. - Instruct employee in the proper use and safeguarding of vehicles, tools and equipment.	Supervisor	First Week		
Employment Agreement	- Explain that the union does not represent him during the probationary period (30 days). - Tell him that he will receive a copy after 30 days of service.	Supervisor	First Week		
Community "Right to Know"	- Discuss the contents of the manual, particularly the valuable source of specific toxic substance information in the Material Safety Data Sheet binders. - Review each item with the employee.	Supervisor	First Week		
Safety	- Explain Detrex's objective of production with no injuries, that all injuries can be prevented and that employee is to report any unsafe conditions and all injuries promptly to you. - Discuss fire and emergency procedures, including location of first aid facilities, fire extinguishers, etc. - Send employee to see the Emergency Coordinator for detailed instructions.	Supervisor and Emergency Coordinator	First Day		

HOURLY ORIENTATION CHECKLIST

Items to Cover	Key Points to Cover	Who Should Cover	When	Item Covered Initial	Item Covered Date
Equal Employment Opportunity	- Inform employee that Detrex does not discriminate and that Detrex bases hourly personnel decisions on merit and seniority.	Supervisor	First Week		
Company Background and Welcome	- Explain corporate operations, the number and location of facilities, the number of employees, etc.	Supervisor	First Week		
Benefits	- Give employee a copy of "Employee Benefits Booklet". - Review the highlights of each plan, including the eligibility date, summary of the coverage, what the employee pays and what the Company pays.	Supervisor	First Week		
Pollution Control	- Explain that Detrex must meet Federal and State laws and regulations pertaining to air, water and land purity. - Point out that the improper handling and disposition of chemicals can pollute the air, water and land and can have adverse impact on Detrex and on Detrex's employees. - Review the required actions to minimize pollution in the plant. - Give employee a copy of the Annual Training and Orientation Checklist for Employees Regarding Hazardous Wastes. Discuss the contents, specifically Detrex's intent to protect our environment through proper handling of hazardous wastes.	Supervisor	First Week		
Energy Conservation	- Point out that Detrex's energy costs, like the employees, are constantly increasing and that Detrex welcomes any suggestions to reduce these energy costs. - Emphasize the need to conserve energy; e.g. heat, light, etc.	Supervisor	First Week		

HOURLY ORIENTATION CHECKLIST

Items to Cover	Key Points to Cover	Who Should Cover	When	Item Covered Initial	Item Covered Date
Acknowledgement of Orientation	- By signing below, the employee acknowledges that his supervisor and Personnel have covered the items listed above and that he intends to comply with the rules contained therein.	Supervisor	Second Week		

Employee's Signature ______________________ Date ____________

Supervisor's Signature ______________________ Date ____________

Personnel's Signature ______________________ Date ____________

* Wherever his, him or he are used, the terms are meant to cover male and female.

DISTRIBUTION: Original for employee's personnel folder in Payroll
Copy for employee's on-site personnel folder
Copy for employee

APPENDIX 4

WHAT TO DO IF YOU GET CHEMICALS SPILLED ON VARIOUS PARTS OF YOUR BODY

WHAT TO DO IF YOU GET CHEMICALS SPILLED ON VARIOUS PARTS OF YOUR BODY

1. Chemicals in the Eye

Splashes of irritant chemicals in the eye, or even exposure to vapor or mist of some chemicals, may lead to serious eye injury. Those who may be exposed to such chemicals should always use proper protective goggles of face shields.

Seconds count. First aid should be immediate, and consists of a thorough flushing of the eye with tap water, using eye bath fountain if available, a gentle stream of water from a hose, or any other means by which the eye may be freely flushed. Lids should be forcibly held apart so that the entire surface of the eye may be flushed. Under most circumstances this flushing should be continued for at least fifteen minutes. Contact lenses should not be worn in chemical laboratories because of the added difficulty they cause in eye irritation.

The patient should then be referred to a physician, preferably an ophthalmologist with experience in handling chemical burns of the eye. Neutralizing solutions should never be used for first aid, since experience has demonstrated that they often aggravate the injury. Ointments are not recommended for first aid use.

2. Chemicals on Body or Clothing

The primary consideration is the prompt removal of the chemical from contact with the skin. This is true whether or not the material has local action. All contaminated clothing should be removed at once, preferably under a shower, and the contacted areas freely flushed with water, preferably with plenty of soap, and under a shower or running water. If exposure has been severe, call a physician, telling him the location of the patient and chemical involved.

The copious use of water to remove as far as possible all traces of the chemical is the most available and effective first aid measure. This applies whether or not the material is water-soluble. Chemical antidotes, such as alkalies for acid contacts and vice versa, or solvents such as alcohol for phenol, should not be used as first aid measures.

After thorough removal of the chemical, the patient should be kept warm and preferably lying down. Further treatment should be as directed by the physician.

SECTION I

CLOSURE AND POST-CLOSURE PLAN

TABLE OF CONTENTS

Page

SECTION I
CLOSURE AND POST-CLOSURE PLAN

LIST OF TABLES

LIST OF ATTACHMENTS

SECTION I

CLOSURE AND POST-CLOSURE PLAN

This section identifies operational activities which are necessary to completely close the hazardous waste container storage area at the end of its intended operating life. A post-closure plan is not required because this is not a disposal facility and all wastes are being removed at closure.

The closure plan and post-closure plan and financial requirements are submitted pursuant to Michigan Act 64 Rule 299.9702(12) which incorporates 40 CFR §270.14(b)(13-18), 264.110 through 120 and 264.178 by reference. The applicable section(s) of the Federal Regulations is referenced as appropriate.

Detrex Corporation will maintain an on-site copy of the approved closure plan, and all revisions to the plan, until the certification of closure completeness has been submitted and accepted by MDNR. Detrex will notify the Director at least 180 days prior to the date Detrex expects to begin final closure at the Gold Shield Solvents facility.

In estimating potential closure costs, cost estimates have been based upon use of third party personnel to close the facility. Estimated costs for removing the maximum waste inventory at time of closure are based upon using the solvent recycling process equipment in the Detroit Gold Shield Solvents facility. Since the hazardous waste container storage area is used for the storage of waste solvents prior to recycling, the recycling operation equipment will exist at all times over the life of the Grand Rapids container storage area [40 CFR §264.142(a)(1).

Upon completion of closure activities, Detrex Corporation will submit a certification to the MDNR Director verified by both Detrex Corporation and an independent registered professional engineer that the facility has been closed in accordance with the specifications in the approved closure plan.

I-1 CLOSURE PLAN [40 CFR §270.14(b)(13), §264.112]

I-1a Closure Performance Standard [40 CFR §264.111]

This closure plan is designed to ensure that the facility will be closed in a manner that:

1) Minimizes the need for further maintenance; and

2) Controls, minimizes, or eliminates, to the extent necessary to protect human health and the environment, post-closure escape of hazardous waste, or hazardous constituents to the ground or surface waters or to the atmosphere.

The following sections present, in detail, efforts which will be made to satisfy the closure performance standard.

1-1b Partial Closure and Final Closure Activities [40 CFR §264.112(a)(1)]

Detrex does not expect to partially close the hazardous waste container storage area. Procedures for final closure of the facility are discussed in Section I-1d. Final closure of the facility is not foreseeable at this time.

I-1c Maximum Waste Inventory [40 CFR §264.112(a)(2)]

The maximum hazardous waste inventory expected to be in storage at any given time is 21,900 gallons (398 x 55-gallon drums).

Table I-1 lists the various wastes handled at the facility, their EPA hazardous waste identification number, and their respective hazardous constituent/characteristic.

I-1d Inventory Removal and Disposal or Decontamination of Equipment [40 CFR §264.112(a)(3), §264.114]

I-1d(1) Closure of Containers (drums) [40 CFR §264.178]

At final closure, a maximum of 21,900 gallons of drummed hazardous waste will be stored in the drum storage area.

TABLE I-1

LIST OF HAZARDOUS WASTES

Hazaradous Waste	EPA Hazardous Waste Number	Hazardous Constituent/Characteristic
1,1,1 Trichloroethane	F001	Toxic
Trichloroethylene	F001	Toxic
Methylene Chloride	F001	Toxic
Perchloroethylene	F001	Toxic
Trichlorotrifluoroethane	F001	Toxic
1,1,1 Trichloroethane	F002	Toxic
Trichloroethylene	F002	Toxic
Methylene Chloride	F002	Toxic
Perchloroethylene	F002	Toxic
Trichlorotrifluoroethane	F002	Toxic

Following the removal of all drums, the drum storage area and secondary containment area will be swept. All sweepings will be drummed and transported off site to a permitted treatment or disposal facility. The secondary containment area will be subsequently decontaminated by steam cleaning. Wash water generated will be collected and transported off site for subsequent treatment or disposal at a permitted facility.

It is estimated that approximately 1800 gallons of waste wash water and two drums of solid waste will be generated during the decontamination process.

Decontamination of the secondary containment area will be verified by conducting wipe tests. The wipe samples will be obtained using a soxhlet extracted cotton gauze pad of predetermined size. The area to be sampled will be delineated using a metal template (4" x 4") or an appropriate measuring device. The wipe samples will then be obtained by wiping the area with the cotton pad, first in one direction and then in a second direction perpendicular to the first. Each individual cotton pad will be moistened with hexane prior to wiping and wiping will be done so that no free hexane is left on the surface. The cotton pads will then be placed in properly labeled sample jars with teflon lined lids. The cotton pads will be analyzed for the major constituents that were in storage.

I-1d(2) Closure of Tanks [40 CFR §264.197]

The Gold Shield Solvents facility does not utilize tanks for hazardous waste storage; hence, a closure plan for tanks is not required.

I-1d(3) Closure of Waste Piles [40 CFR §270.18(i), §264.258]

The Gold Shield Solvents facility does not have a waste pile; hence, a closure plan for waste piles is not required.

I-1d(4) Closure of Surface Impoundments [40 CFR §270.17(g), §264.228]

The Gold Shield Solvents facility does not have a surface impoundment; hence, a closure plan for surface impoundments is not required.

I-1d(5) Closure of Incinerators [40 CFR §264.351]

The Gold Shield Solvents facility does not have an incinerator; hence, a closure plan for incinerators is not required.

I-1d(6) Closure of Land Treatment Facilities [40 CFR §270.20(d)(6), §264.280]

The Gold Shield Solvents facility does not have a land treatment facility; hence, a closure plan for land treatment facilities is not required.

I-1e Schedule of Closure [40 CFR §264.112(a)(4)]

Within 90 days after receipt of the final volume of hazardous wastes, and at the direction of the Board of Directors of Detrex Corporation, final closure activities will be initiated and completed within 180 days of this occurrence. The MDNR Director will be notified by Detrex 180 days before beginning final closure.

A proposed closure schedule is presented as Attachment I-2. Final closure will be certified by both Detrex Corporation and an independent professional engineer.

I-1f Extensions for Closure Time [40 CFR §264.113(a) and (b)]

Detrex Corporation does not anticipate requiring an extension for closure time for the Gold Shield Solvents facility.

I-2 POST-CLOSURE PLAN [40 CFR §270.14(b)(13)]

Post-closure care will not be required for this facility as it is not a disposal facility.

I-3 NOTICE IN DEED AND NOTICE TO LOCAL AUTHORITY [40 CFR §270.14(b)(14) §264.120, §264.117(c), §264.119]

Notation is not necessary in any deed informing potential purchasers of restrictions associated with a disposal site because this facility is only a hazardous waste storage and treatment facility and no hazardous wastes will be disposed on site at any time.

I-4 CLOSURE COST ESTIMATE [40 CFR §270.13(b)(15), 264.142]

The closure cost information is presented in accordance with proper requirements. The total closure cost for the closure of the Detrex Corporation Gold Shield Solvents facility's hazardous waste container storage area is estimated at $30,800 (1988 dollars). Attachment I-3 provides a closure cost estimate. Activities include removal of waste inventory, decontamination and closure certification.

The cost estimate assumptions made are:

1) All drummed hazardous waste will be recycled at the Detroit Gold Shield Solvents in Detroit by a third-party.

2) Labor costs are presented at $25.00 per hour to account for labor costs and $30.00 per hour for supervisors. All labor rates reflect commercial rates and include fringe benefits, payroll burden and taxes.

3) Total costs include a 15% contingency for administrative and 20% contingency for miscellaneous operating costs.

This closure cost estimate will be maintained at this facility. It will be revised whenever a change in the closure plan affects the cost of closure. It will be adjusted as required by pertinent regulations.

I-5 FINANCIAL ASSURANCE MECHANISM FOR CLOSURE [40 CFR §270.14(b)(15) and 264.143]

Financial assurance for closure costs is provided by a demonstration that Detrex Corporation meets the financial test to guarantee the availability of closure funds. Attachment I-4 includes a copy of the latest independent CPA's report on the examination of the Company's latest financial statement, a special CPA report on the data used by the Company's chief financial officer (CFO), and the CFO's certification.

I-6 POST-CLOSURE COST ESTIMATE 40 CFR §270.14(b)(6) and 264.144]

Since all wastes will be recycled or disposed/treated off site, there will be no post-closure activities or costs.

I-7 FINANCIAL ASSURANCE MECHANISM FOR POST-CLOSURE [40 CFR §270.14(b)(16) and 264.145]

Since all wastes will be recycled or disposed/treated off site, there will be no post-closure activities or costs.

I-8 LIABILITY INSURANCE [40 CFR §270.14(b)(17) and 264.147]

I-8a Sudden Accidental Occurrences [40 CFR §264.147(a)]

Financial assurance for sudden accidental insurance is provided by a demonstration that Detrex Corporation meets the financial test. Attachment I-4 includes a copy of the independent CPA's report on the examination of the Company's latest financial statement, a special CPA report on the data used by the Company's chief financial officer (CFO), and the CFO's certification.

I-8b Non-Sudden Occurrences [40 CFR §264.147(b)]

The Gold Shield solvents facility does not have a surface impoundment, landfill or land treatment facility; hence, coverage for nonsudden accidental occurences is not required.

I-9 STATE ASSUMPTION OF RESPONSIBILITY [40 CFR §270.14(b)(18)]

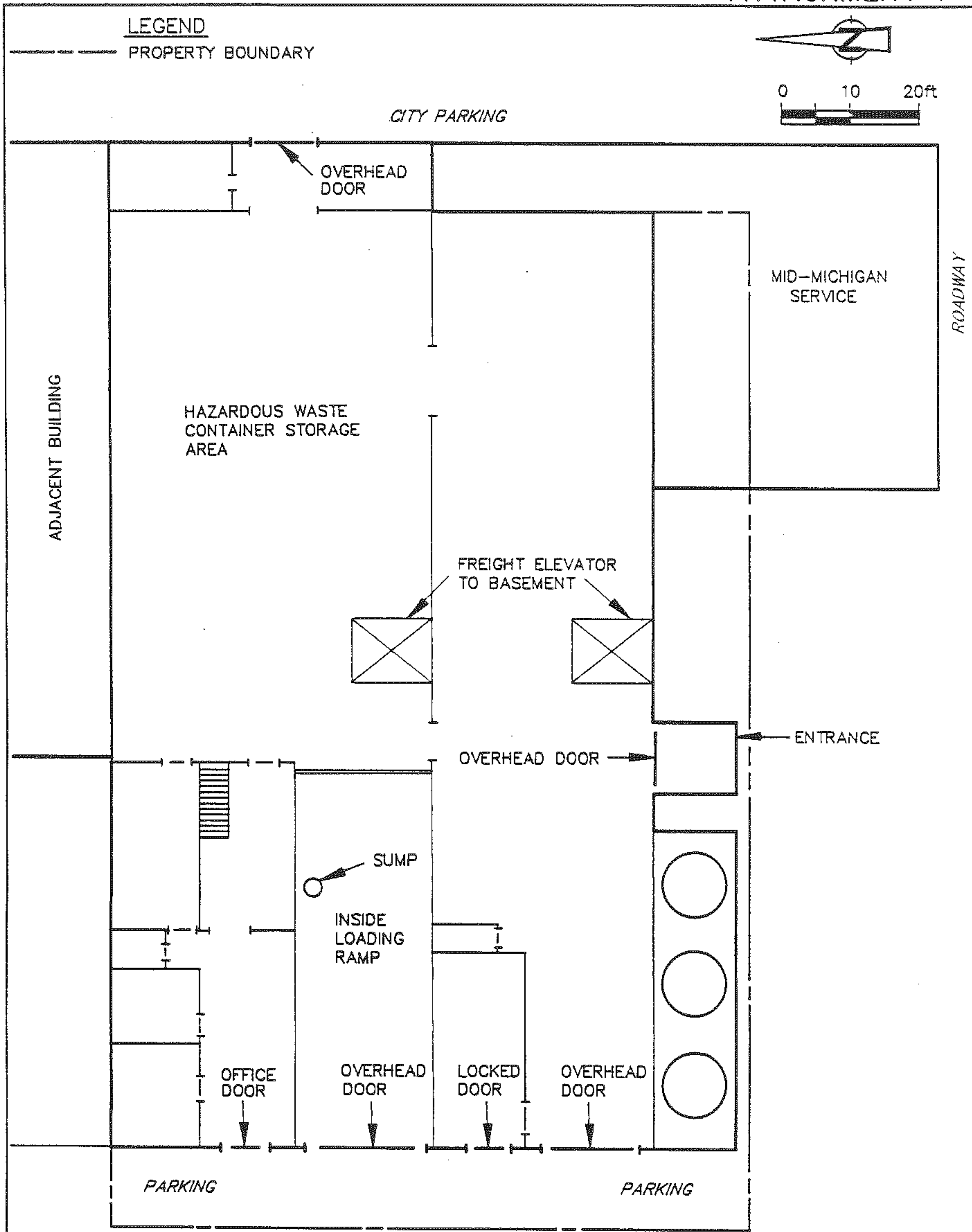
Detrex Corporation does not intend to request State assumption of the legal or financial responsibilities for the Gold Shield Solvents facility.

ATTACHMENT I—1

ATTACHMENT I-1

FACILITY PLAN

ATTACHMENT I-1



FACILITY PLAN
Detrex Corporation
Gold Shield Solvents, Grand Rapids

CRA

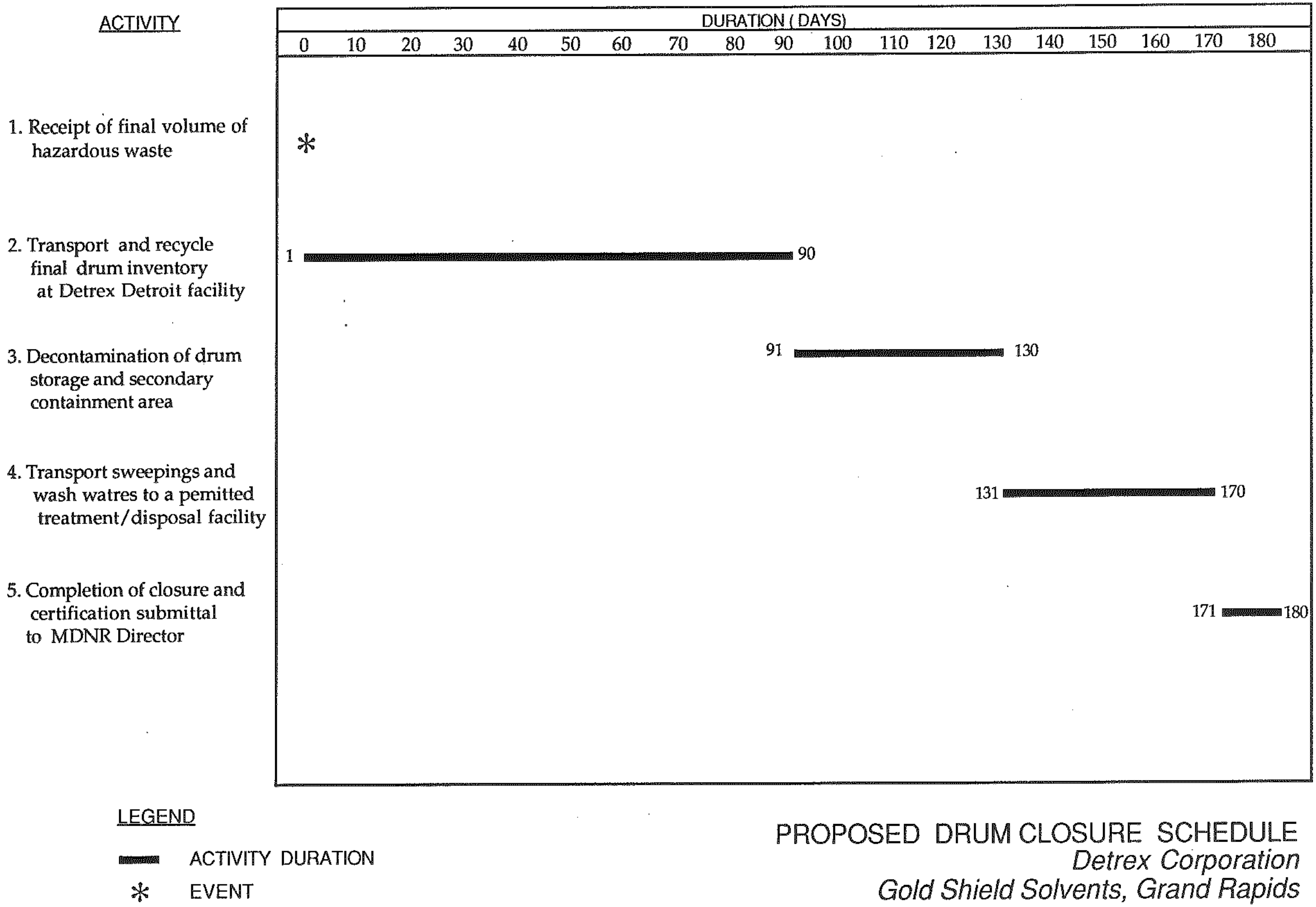
2471-4/11/88-6-D-0

ATTACHMENT I—2

ATTACHMENT I-2

SCHEDULE OF CLOSURE

ATTACHMENT I-2



PROPOSED DRUM CLOSURE SCHEDULE
Detrex Corporation
Gold Shield Solvents, Grand Rapids

CRA

2471 11/03/88-6-F-O

ATTACHMENT
I—3

ATTACHMENT I-3

CLOSURE COST ESTIMATE

Date: 11/08/88
Revision: 88-0
Attachment: I-3

ATTACHMENT I-3
FINAL CLOSURE COST ESTIMATE

Item	Activity	Estimated Cost
1.	Removal of final waste inventory (from container storage area)	
	a) transport drums to Detroit (5 truck loads @ $800/load)	$ 4,000
	b) recycle 398 drums in Detroit @ $2.50 drum*	995
	c) labor: 14 man days @ $200/day	2,800
	d) supervision: 7 man days @ $240/day	1,680
	e) protective safety equipment @ $100/man day	2,100
	Subtotal 1	$ 11,575
2.	Sweep and steam clean drum storage and secondary containment areas	
	a) disposal of 2 drums @ $440	$ 880
	b) disposal of 1800 gallons of wash water @ $0.75/gal.	1,350
	c) labor: 4 man days @ $200/day	800
	d) supervision: 2 man day @ $240/day	480
	e) collect wipe samples and analyze @ $275/sample	1,125
	f) protective safety equipment @ $100/man day	600
	Subtotal 2	$ 5,235
3.	Closure Certification	
	a) Outside consultant to review final closure plans, overview closure activities and certify closure 10 days @ $500/day	$ 5,000
	b) Disbursements including office expenses and travel expenses	1,000
	Subtotal 3	$ 6,000

ATTACHMENT I-3
FINAL CLOSURE COST ESTIMATE - continued

Item	Activity	Estimated Cost
	Subtotal 1 + 2 + 3	$ 22,810
	Administration (15%)	$ 3,420
	Contingency (20%)	$ 4,570
	Total Estimated Final Closure Cost	$ 30,800

Note:

* Cost for recycling in Detroit Detrex facility is based on the following:

i) Average monthly equipment operating costs for recycling process is estimated at $4,500 (i.e. $150 per day).

ii) Recycling of maximum on site inventory at time of closure is estimated to take seven days (i.e. approximately 60 drums per day).

ATTACHMENT
I—4

ATTACHMENT I-4

FINANCIAL ASSURANCE MECHANISM

AND LIABILITY INSURANCE

DETREX CORPORATION

P.O. Box 5111, Southfield, MI 48086-5111

TWX 810-224-4756

TELEPHONE:
(313)358-5800

March 31, 1988

Michigan Department of Natural Resources
Hazardous Waste Division
P. O. Box 30028
Lansing, MI 48909

Re: Financial Requirements - Annual Report

Dear Sir or Madam:

Enclosed is the following for our Michigan facilities at:

12886 Eaton Avenue EPA #MID 09 180 5972
Detroit, MI 48227

312 Ellsworth Avenue, S.W. EPA #MID 02 090 6764
Grand Rapids, MI 49503

1) A letter by our chief financial officer

2) Our 1987 Annual Report

3) A statement by our independent Certified Public Accountant

Should you have any questions, please call me.

Very truly yours,

W. G. Rebrecht
Safety and Loss Prev. Administrator

WGR/smb

Encl.

cc: M. J. Tepatti

DETREX CORPORATION

P.O. Box 5111, Southfield, MI 48086-5111

TELEPHONE:
(313) 358-5800

TWX 810-224-4786

March 31, 1988

Michigan Department of Natural Resources
Hazardous Waste Division
P. O. Box 30028
Lansing, MI 48909

I am the chief financial officer of Detrex Corporation, P. O. Box 5111, Southfield, MI 48086. This letter is in support of the use of the financial test to demonstrate financial responsibility for liability coverage and closure, as specified in Subpart H of 40 CFR, Parts 264 and 265.

The owner or operator identified above is the owner or operator of the following facilities for which liability coverage is being demonstrated through the financial test specified in Subpart H of 40 CFR 264 and 265:

Region	Facility	EPA Identification
I	Gold Shield Division 260 Chapel Road So. Windsor, CT 06074	CTD 01 016 8870
II	Gold Shield Division 835 Industrial Highway Unit No. 1 Cinnaminson, NJ 08077	NJD 06 731 8043
IV	Gold Shield Division P. O. Box 5274 Charlotte, NC 28225	NCD 04 977 3245
V	Gold Shield Division 12886 Eaton Avenue Detroit, MI 48227	MID 09 160 5972
V	Gold Shield Division 312 Ellsworth Avenue, S.W. Grand Rapids, MI 49503	MID 02 090 6764
V	Gold Shield Division 1410 Chardon Road Euclid, OH 44117	OHD 08 015 8702

Region	Facility	EPA Identification
V	Gold Shield Division 2537 LeMoyne Avenue Melrose Park, IL 60160	ILD 07 448 4938
V	Gold Shield Division 2263 Distributors Drive Indianapolis, IN 46241	IND 08 361 6837
V	General Chemicals Division North State Road Ashtabula, OH 44004	OHD 00 416 5924
VI	Gold Shield Division 322 International Parkway Arlington, TX 76011	TXD 98 062 6154
IX	Gold Shield Division 3027 Fruitland Avenue Los Angeles, CA 90058	CAD 02 016 1642

1. The owner or operator identified above owns or operates the following facilities for which financial assurance for closure is demonstrated through the financial test specified in Subpart H of 40 CFR Parts 264 and 265. The current closure cost estimates covered by the test are shown for each facility:

Region	Facility	EPA Identification	Closure Cost
I	Gold Shield Division 260 Chapel Road So. Windsor, CT 06074	CTD 01 016 8870	$ 15,478
II	Gold Shield Division 835 Industrial Highway Unit No. 1 Cinnaminson, NJ 08077	NJD 04 731 8043	Via Trust Fund
IV	Gold Shield Division P. O. Box 5274 Charlotte, NC 28225	NCD 04977 3245	29,452
V	Gold Shield Division 12886 Eaton Avenue Detroit, MI 48227	MID 09 160 5972	18,165
V	Gold Shield Division 312 Ellsworth Avenue, S.W. Grand Rapids, MI 49501	MID 02 090 6764	10,845
V	Gold Shield Division 1410 Chardon Road Euclid, OH 44117	OHD 08 015 8702	6,575

Region	Facility	EPA Identification	Closure Cost
V	Gold Shield Division 2537 LeMoyne Avenue Melrose Park, IL 60160	ILD 07 442 4938	$ 31,634
V	Gold Shield Division 2263 Distributors Drive Indianapolis, IN 46241	IND 08 361 6837	24,831
V	General Chemicals Division North State Road Ashtabula, OH 44004	OHD 00 416 5924	41,000
VI	Gold Shield Division 322 International Parkway Arlington, TX 76011	TXD 98 062 6154	169,494
IX	Gold Shield Division 3027 Fruitland Avenue Los Angeles, CA 9005	CAD 02 016 1642	36,251
			$383,725

2. The owner or operator identified above guarantees, through the corporate guarantee specified in Subpart H of 40 CFR Parts 264 and 265, the closure and post-closure care of the following facilities owned or operated by its subsidiaries. The current cost estimates for the closure or post-closure care so guaranteed are shown for each facility: None.

3. In states where EPA is not administering the financial requirements of Subpart H of 40 CFR Parts 264 and 265, this owner or operator is demonstrating financial assurance for the closure or post-closure care of the following facilities through the use of a test equivalent or substantially equivalent to the financial test specified in Subpart H of 40 CFR Parts 264 and 265. The current closure and/or post-closure cost estimates covered by such a test are shown for each facility: as noted above.

4. The owner or operator identified above owns or operates the following hazardous waste management facilities for which financial assurance for closure or, if disposal facility, post-closure care, is not demonstrated either to EPA or a State through the financial test or any other financial assurance mechanism specified in Subpart H of 40 CFR Parts 264 and 265 or equivalent or substantially equivalent State mechanisms. The current or equivalent closure and/or post-closure cost estimates are not covered by such financial assurance are shown for each facility: None.

The owner or operator is required to file a Form 10K with the Securities and Exchange Commission (SEC) for the latest fiscal year.

The fiscal year of this firm ends on December 31. The figures for the following items marked with a asterisk are derived from this firm's independently audited, year-end financial statements for the latest completed fiscal year, ended 1987.

1.	Sum of current closure cost estimates (total of all cost estimates listed above)	$ 383,7[illegible]	
2.	Amount of annual aggregate liability coverage to be demonstrated	2,000,000	
3.	Sum of lines 1 and 2	2,383,725	
*4.	Total liabilities (if any portion of the closure cost estimates is included in total liabilities, you may deduct the amount of that portion from this line and add that amount to lines 5 and 6)	19,700,498	
*5.	Tangible net worth	40,301,323	
*6.	Net worth	41,027,175	
*7.	Current assets	36,366,792	
*8.	Current liabilities	10,404,482	
*9.	Net working capital (line 7 minus line 8)	25,962,310	
*10.	The sum of net income plus depreciation, depletion and amortization	6,077,893	
*11.	Total assets in U.S. (required only if less than 90% of firm's assets are located in the U.S.)	N/A	
		Yes	**No**
12.	Is line 5 at least $10 million?	X	
13.	Is line 5 at least 6 times line 3?	X	
14.	Is line 9 at least 6 times line 3?	X	
*15.	Are at least 90% of firm's assets located in the U.S.? If not, complete line 16	X	
16.	Is line 11 at least 6 times line 1?	N/A	
17.	Is line 4 divided by line 6 less than 2.0?	X	
18.	Is line 10 divided by line 4 greater than 0.1?	X	
19.	Is line 7 divided by line 8 greater than 1.5?		

I hereby certify that the wording of this letter is identical to the wording specified in 40 CFR 264.151(g) as such regulations were constituted on the date shown immediately below.

Very truly yours,

C. B. Stockmeyer, Jr.
Vice President & Treasurer

March 31, 1988

/smb

ACCOUNTANTS' REPORT

Deloitte Haskins+Sells
Certified Public Accountants

100 Renaissance Center
Detroit, Michigan 48243

To the Board of Directors and Stockholders of
Detrex Corporation

We have examined the consolidated balance sheets of Detrex Corporation and its subsidiaries as of December 31, 1987 and 1986 and the related consolidated statements of income and retained earnings and of changes in financial position for each of the three years in the period ended December 31, 1987. Our examinations were made in accordance with generally accepted auditing standards and, accordingly, included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances.

In our opinion, the accompanying consolidated financial statements present fairly the financial position of the companies at December 31, 1987 and 1986 and the results of their operations and the changes in their financial position for each of the three years in the period ended December 31, 1987, in conformity with generally accepted accounting principles consistently applied during the period except for the change, with which we concur, in 1987 in the method of accounting for income taxes as described in Note 5 to the consolidated financial statements.

Deloitte Haskins + Sells

February 29, 1988

DETREX CORPORATION

1987 ANNUAL REPORT

HIGHLIGHTS

	1987	1986	1985
Net sales	$100,257,000	$94,205,000	$88,268,000
Income before accounting change	2,639,000	2,495,000	4,753,000
Cumulative effect of accounting change	458,000		
Net income	3,097,000	2,495,000	4,753,000
Earnings per common share before accounting change	1.67	1.58	3.01
Cumulative effect of accounting change per common share	.29		
Earnings per common share	1.96	1.58	3.01
Cash dividends per common share	1.20	1.20	1.20
Stockholders' equity per common share	25.96	25.20	24.82
Additions to land, buildings and equipment	3,921,000	6,902,000	4,614,000
Current ratio	3.5 to 1	3.7 to 1	3.6 to 1
Percent long-term debt to equity	17.9	20.8	1.5
Number of stockholders	762	825	945
Number of employees	595	742	666

TO OUR SHAREHOLDERS:

Detrex sales and net income were $100,257,000 and $3,097,000, respectively, for 1987 while sales for the previous year were $94,205,000 and net income was $2,495,000. Net income for 1987 includes $458,000 which represented the effect of an accounting change concerning deferred income taxes.

We are maintaining our strong emphasis on research and development with expenditures for these activities in 1987 at $2,326,000. This represents the second highest level of expenditures for research and development in our company history.

A number of new products have been introduced by our profit centers as a result of our various ongoing research activities. Some of these products include an additive for paper machine oils, a new line of soluble oil bases, a non-chlorinated, non-toxic extreme pressure additive to replace chlorinated wax; a new HVP line of high pressure defluxer machines for cleaning complex electronic assemblies and sophisticated printed circuit boards; new dry film lubricants; cleaners and patented ultrasonic phosphating compounds for the coil coater industries; and heat treat systems for aluminum alloys and mesh belt atmosphere controlled furnace lines.

Detrex has established a new analytical and testing laboratory entity, RTI, which will be providing contract services for companies requiring sophisticated analytical assistance in environmental matters and specialized testing in metalworking, water treatment, paints and coatings. While the beginning for RTI will not be in the form of a giant step, we believe, in time it will provide Detrex with significant growth.

Seibert-Oxidermo, which was acquired by Detrex in 1986, and Viking Chemicals, which was acquired the year before, are continuing their programs to expand marketing of their lines of products and are also maintaining joint projects with our other profit centers to augment sales of our various lines of products. All of the programs are designed to produce additional revenues and profits for our company.

While our Solvents Division has been profitably marketing its services in reclamation and recycling of spent chlorinated solvents to its customers, it has not heretofore been involved with flammable solvents. The Solvents Division has completed studies and investigations and expects to be providing additional service to those customers who employ flammable as well as chlorinated solvents. This additional service will enable the Solvents Division to add greater value to the many ways it serves its customers.

We are continuing our program of evaluating suitable candidates for acquisition which meet our objectives of "fit" and margin and which provide opportunities for growth.

During 1987 we have continued our programs to provide optimum quality and reduced unit operating costs at our customers' plants. Programs are also continuing at our Detrex profit centers to reduce operating expenses and improve margins.

We report with sadness the death on January 18, 1988 of Mr. Robert A. Emmett, Jr., who had served on the Board of Directors from March 29, 1951 until his death. Mr. Emmett was employed by the Company from June 10, 1946 until his retirement December 31, 1983. During most of his employment period, Mr. Emmett was a Vice President in charge of several divisions and departments, and played a leadership role in developing and manufacturing products and processes which added a great deal to the growth and sales of the Company.

We honor Mr. Emmett for his loyalty and for his adherence to the ideals of honesty and business ethics.

Following the loss of Robert A. Emmett, Jr., the Board of Directors has fixed the number of Directors of the Corporation at eight.

We wish to extend our sincere appreciation to all of our employees for their fine performance and their dedication.

Louis Schlossberg
President

A. O. Thalacker
Chairman

DETREX CORPORATION

CONSOLIDATED BALANCE SHEETS

December 31

ASSETS

	1987	1986
Current Assets:		
Cash and short-term investments	$ 4,621,438	$ 2,388,524
Accounts receivable	17,062,604	19,078,075
Inventories	13,860,121	14,452,411
Prepaid expenses and deferred income taxes	822,629	1,268,984
Total Current Assets	36,366,792	37,187,994
Land, Buildings and Equipment:		
Land	1,044,468	1,044,468
Buildings and improvements	15,985,142	15,223,006
Machinery and equipment	24,443,866	22,449,937
Construction in progress	1,057,105	1,118,810
	42,530,581	39,836,221
Less allowance for depreciation and amortization	20,210,281	18,261,130
Land, Buildings and Equipment—Net	22,320,300	21,575,091
Other Assets	2,040,581	2,089,784
	$60,727,673	$60,852,869

See Notes to Consolidated Financial Statements.

LIABILITIES AND STOCKHOLDERS' EQUITY

	1987	1986
Current Liabilities:		
Current maturities of long-term debt	$ 1,568,354	$ 724,809
Accounts payable	4,312,881	4,369,092
Income taxes	198,767	56,603
Accrued payroll and commissions	1,246,208	1,754,166
Accrued insurance and other liabilities	3,078,272	3,074,896
Total Current Liabilities	10,404,482	9,979,566
Long-Term Debt	7,343,734	8,288,221
Deferred Income Taxes	1,952,282	2,757,983
Stockholders' Equity:		
Common stock	3,160,828	3,160,828
Retained earnings	37,866,347	36,666,271
Total Stockholders' Equity	41,027,175	39,827,099
	$60,727,673	$60,852,869

See Notes to Consolidated Financial Statements.

DETREX CORPORATION

CONSOLIDATED STATEMENTS OF INCOME AND RETAINED EARNINGS

For the Years Ended December 31

	1987	1986	1985
Net Sales	$100,256,924	$94,204,793	$88,268,265
Costs and Expenses:			
Cost of sales	72,781,067	68,254,108	60,697,055
Selling, general and administrative expenses	19,201,960	18,382,335	16,442,105
Provision for depreciation and amortization	2,981,320	2,689,341	2,400,922
Total Costs and Expenses	94,964,347	89,325,784	79,540,082
Operating income	5,292,577	4,879,009	8,728,183
Other income—net	489,068	284,950	378,637
Interest expense	943,394	425,213	183,625
Income before income taxes	4,838,251	4,738,746	8,923,195
Provision for income taxes	2,199,382	2,243,702	4,170,350
Income before accounting change	2,638,869	2,495,044	4,752,845
Cumulative effect on prior years of change in accounting for income taxes	457,704		
Net Income	3,096,573	2,495,044	4,752,845
Retained Earnings at Beginning of Year	36,666,271	36,067,724	33,211,376
	39,762,844	38,562,768	37,964,221
Deduct:			
Cash dividends on common stock—1987, 1986 and 1985, $1.20 per share	1,896,497	1,896,497	1,896,497
Retained Earnings at End of Year	$ 37,866,347	$36,666,271	$36,067,724
Earnings Per Common Share:			
Before accounting change	$1.67	$1.58	$3.01
Cumulative effect of accounting change	.29		
Net Earnings	$1.96	$1.58	$3.01

See Notes to Consolidated Financial Statements.

DETREX CORPORATION

CONSOLIDATED STATEMENTS OF CHANGES IN FINANCIAL POSITION

For the Years Ended December 31

	1987	1986	1985
Funds Provided:			
Operations:			
Income before accounting change	$ 2,638,869	$ 2,495,044	$ 4,752,845
Add (deduct) items not affecting funds:			
Depreciation and amortization	2,981,320	2,689,341	2,400,922
Deferred income taxes	(805,701)	684,867	406,774
Total from Operations Before Acounting Change	4,814,488	5,869,252	7,560,541
Cumulative effect of accounting change	457,704		
Total from Operations	5,272,192	5,869,252	7,560,541
Working Capital Changes:			
Accounts receivable	2,015,471	(2,600,210)	(2,341,200)
Inventories	592,290	(1,487,759)	(966,621)
Prepaid expenses and deferred income taxes	446,355	(146,566)	181,396
Current maturities of long-term debt	843,545	187,098	(4,757)
Accounts payable	(56,211)	812,668	(743,588)
Income taxes	142,164	(43,170)	(492,888)
Accrued payroll and commissions	(507,958)	(35,351)	68,940
Accrued insurance and other liabilities	3,376	2,039	(592,884)
Total from Working Capital Changes	3,479,032	(3,311,251)	(4,891,602)
Disposals of machinery and equipment	385,608	417,932	369,381
Increase in long-term debt		7,685,888	
Total Funds Provided	9,136,832	10,661,821	3,038,320
Funds Used:			
Expenditures for buildings and equipment	3,920,592	6,901,854	4,614,396
Cash dividends	1,896,497	1,896,497	1,896,497
Increase in other assets	142,342	1,129,157	844,728
Decrease in long-term debt	944,487		150,952
Total Funds Used	6,903,918	9,927,508	7,506,573
Increase (Decrease) in Cash and Short-Term Investments	$ 2,232,914	$ 734,313	$(4,468,253)

See Notes to Consolidated Financial Statements.

DETREX CORPORATION

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

1. Summary of Significant Accounting Policies

Basis of Financial Statements

The consolidated financial statements comprise those of the Company and all of its subsidiaries. All balances and transactions between the companies have been eliminated.

Inventories

Inventories are stated at the lower of cost or market. Cost of raw materials, including raw materials in work in process and finished goods inventories, is determined by using the last-in, first-out method. Labor and burden in inventory are determined by using the average cost method. Inventories relating to fixed-price contracts are stated at the accumulated cost of material, labor and burden less related progress billings.

Land, Buildings and Equipment

Land, buildings and equipment are stated at cost. Depreciation and amortization are provided over the estimated useful lives of the assets using the straight-line method for financial reporting purposes. Leased equipment is amortized over the lease term. Annual depreciation rates for financial reporting purposes range from 2.5% to 20% for buildings and improvements and from 6.7% to 33.3% for machinery and equipment.

Research and Development

Research and development costs are charged to income as incurred. Research and development costs for 1987, 1986 and 1985 were approximately $2,326,000, $2,629,000 and $1,642,000, respectively.

Earnings Per Common Share

Earnings per common share are based upon the average number of common shares outstanding during the year.

Industry Segment

The Company and its subsidiaries operate predominantly in a single industry, chemicals and allied products, and supply processes for use by manufacturing and service industries.

2. Inventories

Inventories at December 31 consist of the following:

	1987	1986
Finished goods and work in process	$ 8,747,539	$ 8,547,623
Raw materials	5,112,582	5,904,788
Total	$13,860,121	$14,452,411

The excess of current cost over the stated last-in, first-out value is approximately $1,666,000 and $1,481,000 at December 31, 1987 and 1986, respectively.

3. Capital and Operating Leases

Capitalized leased assets (primarily automobiles, railroad tank cars and trucks and trailers) at December 31 are as follows:

	1987	1986
Machinery and equipment	$2,139,972	$1,923,046
Accumulated amortization	1,165,264	1,060,962
Leased assets—net	$ 974,708	$ 862,084

Rent expense applicable to operating leases for 1987, 1986 and 1985 was $710,000, $597,000 and $553,000, respectively.

Minimum annual lease payments for leases in effect at December 31, 1987 are as follows:

Minimum Lease Payments:	Capital	Operating
1988	$ 587,800	$ 691,000
1989	422,400	477,000
1990	177,800	70,000
1991	99,600	42,000
1992		23,000
Total minimum lease payments	1,287,600	$1,303,000
Less amount representing estimated executory costs (such as taxes, maintenance and insurance) and profit thereon included in total minimum lease payments	171,763	
Net minimum lease payments	1,115,837	
Less amount representing interest	111,208	
Present value of net minimum lease payments	1,004,629	
Less current portion	459,008	
Non-current portion	$ 545,621	

4. Long-Term Debt

The composition of long-term debt, exclusive of current maturities, as of December 31 is as follows:

	1987	1986
Term note at interest rate of 8.9%; due through 1991	$6,750,000	$7,750,000
Mortgages payable with interest principally at .9%; due through 1994	48,113	71,141
Capitalized lease obligations at interest rates from 5.7% to 15.1%; due through 1990 (see Note 3)..................	545,621	467,080
	$7,343,734	$8,288,221

The mortgages payable are collateralized by buildings with a carrying value of $2,027,000 at December 31, 1987.

The approximate aggregate annual maturities of long-term debt (exclusive of capital lease obligations) for the five years subsequent to December 31, 1987 are as follows: 1988, $1,109,346; 1989, $1,014,700; 1990, $1,007,900; 1991, $4,758,000; 1992 and after, $17,513.

The Company had unused lines of credit of $6,000,000 as of December 31, 1987.

5. Income Taxes

Financial Accounting Standards Board Statement No. 96, "Accounting for Income Taxes," was adopted by the Company effective January 1, 1987. The cumulative effect of the change on prior years was to increase income in 1987 by $457,704 or $.29 per share. Deferred income taxes for years prior to 1987 were computed based on generally accepted accounting principles in effect for those years.

The provision for income taxes for the years ended December 31 is summarized below:

	1987	1986	1985
Current:			
Federal	$1,605,511	$1,387,521	$2,818,072
State and local	270,983	211,030	402,148
Total current	1,876,494	1,598,551	3,220,220
Deferred:			
Federal	257,783	539,089	838,038
State and local	65,105	106,062	112,092
Total deferred	322,888	645,151	950,130
	$2,199,382	$2,243,702	$4,170,350

Deferred taxes result from timing differences in the recognition of revenue and expense for tax and financial statement purposes. The sources of these differences and the tax effect of each were as follows:

	1987	1986	1985
Depreciation and amortization ...	$ 207,263	$ 388,625	$ 447,620
Accruals not deductible until paid	58,650	81,376	250,865
Undistributed earnings of Company's DISC.............	79,949	210,524	160,436
Other—net	(22,974)	(35,374)	91,209
	$ 322,888	$ 645,151	$ 950,130

The effective income tax rates for 1987, 1986 and 1985 were 45.5%, 47.4% and 46.7%, respectively. The reasons for the difference between the income tax provision which resulted in these effective rates and income taxes computed at 40% for 1987 and at 46% for 1986 and 1985 are summarized below:

	1987	1986	1985
Computed "expected" tax provision	$1,935,300	$2,179,823	$4,104,670
Research and development tax credit		(140,997)	(50,239)
Investment tax credit, net of investment credit recapture....		3,441	(178,318)
State and local income taxes, net of federal tax benefit..........	201,653	171,230	277,690
Other—net	62,429	30,205	16,547
	$2,199,382	$2,243,702	$4,170,350

6. Pension and Postretirement Costs

The Company and its subsidiaries have several noncontributory, defined benefit pension plans which cover substantially all employees. Benefits for salaried employees are based on years of service and the employee's average monthly compensation using the highest five consecutive years preceding retirement. Benefits for hourly employees are based on a specified payment per month for each year of service. The Company's funding policy is to contribute amounts sufficient to provide for benefits earned to date and those expected to be earned in the future.

Net pension cost of $5,932 and $103,953 for 1987 and 1986, respectively, was computed based on Financial Accounting Standards Board Statement No. 87, "Employers' Accounting for Pensions." Pension expense of $155,000 for 1985 was computed based on generally accepted accounting principles in effect for that period.

The following table sets forth the plans' funded status and amounts recognized in the Company's balance sheet at December 31, 1987 and 1986:

	1987	1986
Actuarial present value of benefit obligations:		
Accumulated benefit obligations:		
Vested benefits	$10,881,742	$10,979,261
Non-vested benefits ..	1,185,444	843,002
Total	$12,067,186	$11,822,263
Projected benefit obligation for service rendered to date	$16,950,314	$14,847,133
Plan assets at fair value—primarily equity and fixed income bond funds and group annuity insurance contracts	19,306,313	18,753,647
Excess of plan assets over projected benefit obligation	2,355,999	3,906,514
Unrecognized net asset at January 1, 1986 being recognized principally over 15 years	(2,892,725)	(3,100,588)
Unrecognized net loss (gain) from past experience different from that assumed	488,604	(909,879)
Pension liability included in other liabilities	$ (48,122)	$ (103,953)

Net pension cost included the following components:		
Service cost-benefits earned during the year	$ 697,134	$ 608,841
Interest cost on projected benefit obligations	1,234,402	1,083,409
Actual return on plan assets ..	(1,110,709)	(2,290,313)
Net amortization and deferral	(814,895)	702,016
Net periodic pension cost ...	$ 5,932	$ 103,953

The discount rate and rate of increase in future compensation levels used in determining the actuarial present value of the projected benefit obligation were 8.5% and 6.5%, respectively. The expected long-term rate of return on assets was 8.5%.

In addition to providing pension benefits, the Company and its subsidiaries provide certain health care benefits to retired employees. The majority of the Company's employees may become eligible for the benefits if they reach normal retirement age while working for the Company. The cost of retiree health care benefits, which is immaterial, is recognized as an expense when the related premiums are paid.

7. Capital Stock

The number and amount of shares of capital stock are as follows:

Preferred Stock—authorized 1,000,000 shares of $2 par value each, issuable in series. No shares were issued or outstanding as of December 31, 1987, 1986 and 1985.

Common Stock—authorized 4,000,000 shares of $2 par value each. The number of shares issued and outstanding as of December 31, 1987, 1986 and 1985 was 1,580,414.

8. Other Income—Net

Other income consists principally of interest income of approximately $238,000, $69,000 and $316,000 for 1987, 1986 and 1985, respectively, and miscellaneous service income of $340,000, $386,000 and $242,000 in 1987, 1986 and 1985, respectively.

9. Contingencies

The U.S. Environmental Protection Agency ("EPA") has notified the Company and 17 other companies that they may be potentially responsible for sharing the costs involved in a proceeding to clean up contaminated sediments in the Fields Brook watershed in Ashtabula, Ohio. The EPA has issued a Record of Decision concerning the methods it recommends using to accomplish this task. The Company and the other potentially responsible parties have expressed their disagreement with this recommendation, but will continue to negotiate with the EPA as to how best to effect the clean-up operation. At this time, managment cannot determine when, and to what extent, the Company may have to share the costs associated with the clean-up. In addition, there are several other claims and lawsuits pending against the Company and its subsidiaries.

Although the amount of liability, if any, at December 31, 1987, with respect to the actions then pending to which the Company and its subsidiaries are party cannot be ascertained, the disposition of the above matters, in the opinion of management, on the basis of information furnished by counsel, will not have a material effect on the Company's consolidated financial position.

Deloitte
Haskins+Sells
Certified Public Accountants

100 Renaissance Center
Detroit, Michigan 48243

To the Board of Directors and Stockholders of
Detrex Corporation

We have examined the consolidated balance sheets of Detrex Corporation and its subsidiaries as of December 31, 1987 and 1986 and the related consolidated statements of income and retained earnings and of changes in financial position for each of the three years in the period ended December 31, 1987. Our examinations were made in accordance with generally accepted auditing standards and, accordingly, included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances.

In our opinion, the accompanying consolidated financial statements present fairly the financial position of the companies at December 31, 1987 and 1986 and the results of their operations and the changes in their financial position for each of the three years in the period ended December 31, 1987, in conformity with generally accepted accounting principles consistently applied during the period except for the change, with which we concur, in 1987 in the method of accounting for income taxes as described in Note 5 to the consolidated financial statements.

Deloitte Haskins + Sells

February 29, 1988

MANAGEMENT'S DISCUSSION AND ANALYSIS OF FINANCIAL CONDITION AND RESULTS OF OPERATIONS

Liquidity and Capital Resources

The Company generates cash from operations sufficient to meet its needs for working capital, dividend payments on capital stock and capital expenditures.

A measure of liquidity used by the Company for internal management purposes can be illustrated by a review of cash and short-term investments.

Cash and Short-Term Investments

The following analysis is a condensation of the data contained in the Consolidated Statements of Changes in Financial Position. The comparisons (in thousands) are as follows:

	1987	1986	1985
Funds provided from operations	$ 5,272	$ 5,869	$ 7,561
Expenditures—net:			
Buildings and equipment	3,535	6,484	4,245
Dividends	1,896	1,896	1,896
Decrease (increase) in long-term debt	944	(7,686)	151
(Decrease) increase in other working capital items	(3,479)	3,311	4,892
Increase in other assets	143	1,130	845
	3,039	5,135	12,029
Increase (decrease) in Cash and Short-Term Investments	$ 2,233	$ 734	$(4,468)

With the exception of transportation equipment and the 1986 Scibert-Oxidermo asset purchase, the Company's capital spending programs have been financed using internally generated funds. The Company does not presently plan to borrow additional long-term funds, sell securities or enter into any material off-balance sheet financing arrangements. The Company had unused lines of credit of $6,000,000 at December 31, 1987.

Results of Operations

Comparative operating data (in thousands) are summarized below:

	1987		1986		1985	
	$	%	$	%	$	%
Sales	100,257	100.0	94,205	100.0	88,268	100.0
Gross profit	27,476	27.4	25,951	27.6	27,571	31.2
Operating expenses	19,202	19.2	18,382	19.5	16,442	18.6
Depreciation and amortization	2,981	3.0	2,689	2.8	2,401	2.7
Operating income	5,293	5.3	4,879	5.2	8,728	9.9

MANAGEMENT'S DISCUSSION AND ANALYSIS OF FINANCIAL CONDITION AND RESULTS OF OPERATIONS—Continued

Sales and Gross Profit

The year 1987—Increases in gross profit reflect the full-year profit contribution of Seibert-Oxidermo (which was acquired by the Company in August 1986,) sales volume increases in some commodity type product lines and tighter cost controls. These increases were partially offset by reduced sales volume at some of the Company's profit centers. The net result is a sales volume increase which yielded an increase in gross profit.

The year 1986—Decreases in gross profit resulted from cost overruns relating to new products developed, various costs associated with product warranties and related liabilities, and increases in the ratio of cost to selling price in commodity type product lines. These decreases were partially offset by gross profit gains on increased chemical specialty sales volume.

The year 1985—The gross profit levels remained comparable with the year 1984 despite a 1.9% decrease in overall sales volume. This reflects a more favorable mix in the sales of higher margin products and the continuing stability of raw material costs.

Inflation—The moderate level of inflation during the three year period has not had any significant impact on the Company.

Operating Expenses

Increases in 1987 reflect higher sales volume and modest inflationary pressures, offset to some extent by operating expense reductions in certain areas.

Increases in 1986 reflect higher sales volume, increased product development and modest inflationary pressures.

Increases in 1985 were the result of modest inflationary pressures.

A COPY OF THE COMPANY'S ANNUAL REPORT ON FORM 10-K AS FILED WITH THE SECURITIES AND EXCHANGE COMMISSION FOR THE YEAR 1987 WILL BE FURNISHED WITHOUT CHARGE TO SHAREHOLDERS UPON WRITTEN REQUEST. REQUESTS ARE TO BE SENT TO VICE PRESIDENT-TREASURER, DETREX CORPORATION, 4000 TOWN CENTER, SUITE 1100, SOUTHFIELD, MICHIGAN 48075.

DESCRIPTION OF BUSINESS

Detrex Corporation and its subsidiaries operate predominantly in a single industry, chemicals and allied products, and supply processes for use by manufacturing and service industries. The products include specialty chemicals, industrial cleaners, phosphate coatings, drawing lubricants, chlorinated solvents, degreasing and defluxing equipment, soldering machines, ultrasonic degreasers, drycleaning machines, industrial furnaces, commercial and reagent grade muriatic acid, PVC plastic pipe and fittings, industrial finishing materials and paints, and water treatment chemicals and equipment. The products are primarily sold by sales-service engineers. Most sales are direct to industrial users with lesser amounts to distributors for resale to industrial users.

Net sales by product line for each of the last five years are set forth below:

	Net Sales		
	Product Line		
	Chemical Products	Chemical Equipment	Total
1987	$76,512,225	$23,744,699	$100,256,924
1986	66,725,717	27,479,076	94,204,793
1985	62,337,906	25,930,359	88,268,265
1984	70,375,994	19,578,927	89,954,921
1983	59,773,729	14,137,943	73,911,672

SUPPLEMENTARY INFORMATION

Selected Quarterly Data

(Thousands of dollars except per share amounts)

	1987 Quarters				1986 Quarters			
	4th	3rd	2nd	1st	4th	3rd	2nd	1st
Net sales	$24,040	$26,479	$25,010	$24,728	$23,135	$24,784	$23,709	$22,577
Gross profit on sales	5,890	6,966	7,559	7,061	4,508	7,085	7,357	7,001
Income (loss) before accounting change	85	579	1,077	898(1)	(953)(2)	967	1,223	1,258
Cumulative effect of accounting change				458(1)				
Net income (loss)	85	579	1,077	1,356(1)	(953)(2)	967	1,223	1,258
Earnings (loss) per common share before accounting change	.05	.36	.70	.56(1)	(.60)(2)	.61	.77	.80
Cumulative effect of accounting change per common share				.29(1)				
Earnings (loss) per common share	.05	.36	.70	.85(1)	(.60)(2)	.61	.77	.80
Dividends per common share	.30	.30	.30	.30	.30	.30	.30	.30
Stock price range(5)								
High	32	37¼	40½	44	40¼	45¾	45¾	36¼
Low	20	30	35¼	37½	37½	38¼	35½	34½

Notes for Selected Quarterly Data and Selected Financial Data

(1) Previously reported earnings for the 1987 first quarter have been restated to include a credit of $457,704, or $.29 per common share, which is the cumulative effect on prior years of an accounting change to adopt Financial Accounting Standards Board Statement No. 96, "Accounting for Income Taxes." The effect of the change on the first three quarters of 1987 was not material.

(2) The 1986 fourth quarter loss includes a charge of $1,164,000, or $.74 per common share, to reflect cost overruns and development costs relating to new products, as well as various costs associated with product warranties and related liabilities. The 1986 fourth quarter loss also includes a charge of $127,000, or $.08 per common share, due to elimination of investment tax credits under the Tax Reform Act of 1986.

(3) Net income as a percent of sales and other net income ratios for 1984 reflect a deferred income tax reversal of $510,440 or $.32 per share due to a change in the tax law covering Domestic International Sales Corporations.

(4) Amounts per share for 1983 have been restated to give retroactive effect to the 100% stock distribution, the equivalent of a two-for-one stock split, declared on January 19, 1984 and distributed on February 24, 1984.

(5) Stock price range was obtained from National Over-The-Counter bid prices.

Selected Financial Data

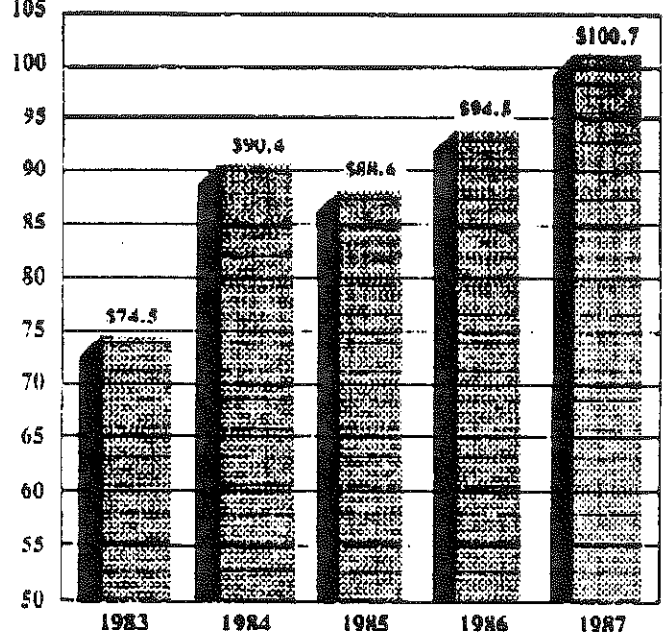
(Thousands of dollars except per share amounts)

	1987	1986	1985	1984	1983(4)
Net sales	$100,257	$94,205	$88,268	$89,955	$73,912
Income before accounting change	2,639(1)	2,495(2)	4,753	5,531(3)	3,969
Cumulative effect of accounting change	458(1)				
Net income	3,097(1)	2,495(2)	4,753	5,531(3)	3,969
Earnings per common share before accounting change	1.67(1)	1.58(2)	3.01	3.50(3)	2.51
Cumulative effect of accounting change per common share	.29(1)				
Earnings per common share	1.96(1)	1.58(2)	3.01	3.50(3)	2.51
Dividends per common share	1.20	1.20	1.20	1.20	1.05
Total assets	60,728	60,853	50,960	49,613	46,016
Net working capital	25,962	27,208	23,163	22,740	20,978
Additions to land, buildings and equipment	3,921	6,902	4,614	4,259	2,920
Long-term debt	7,344	8,288	602	753	727
Stockholders' equity	41,027	39,827	39,229	36,372	32,737
Stockholders' equity per common share	25.96	25.20	24.82	23.01	20.71
Number of employees	595	742	666	617	562
Percentages to net sales:					
Gross profit	27.4	27.6	31.2	30.2	31.0
Net income	3.1(1)	2.7(2)	5.4	6.1(3)	5.4
Net income as a percent of:					
Average total assets	5.1(1)	4.5(2)	9.5	11.6(3)	9.1
First of year stockholders' equity	7.8(1)	6.4(2)	13.1	16.9(3)	13.0
Current ratio	3.5	3.7	3.6	3.1	3.0
Percent long-term debt to equity	17.9	20.8	1.5	2.1	2.2

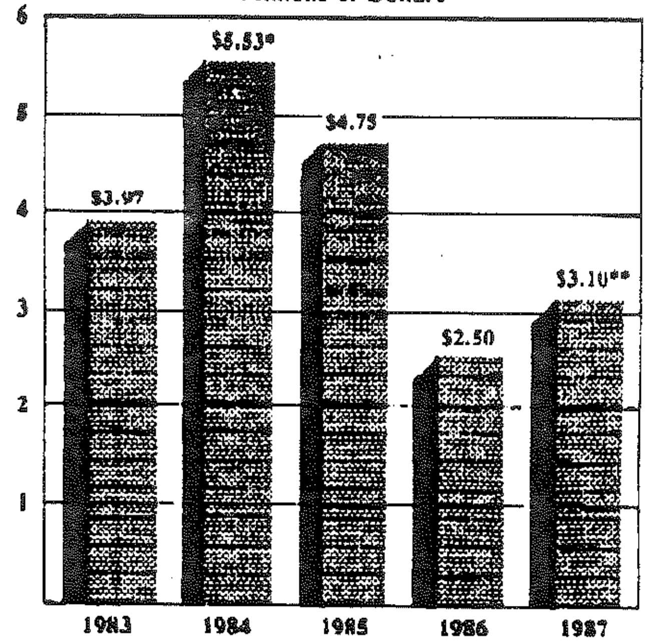
DETREX CORPORATION AND SUBSIDIARIES

5 YEAR HIGHLIGHTS

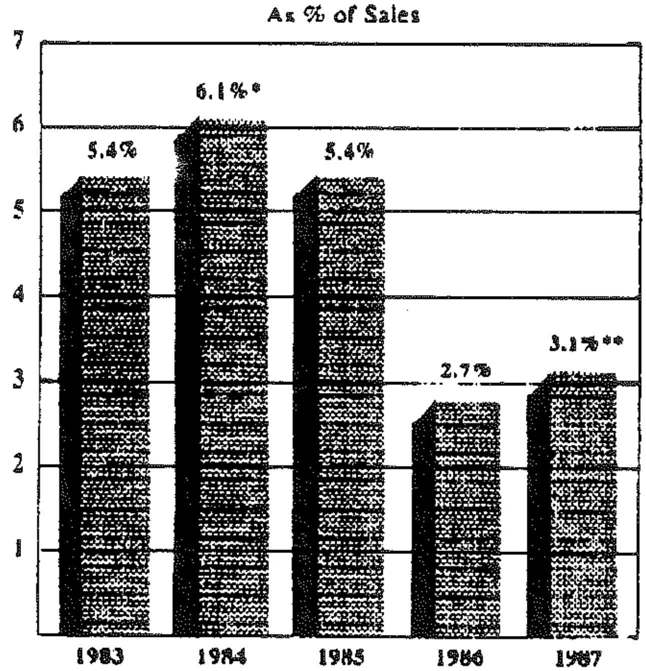
Sales and Other Income
Millions of Dollars



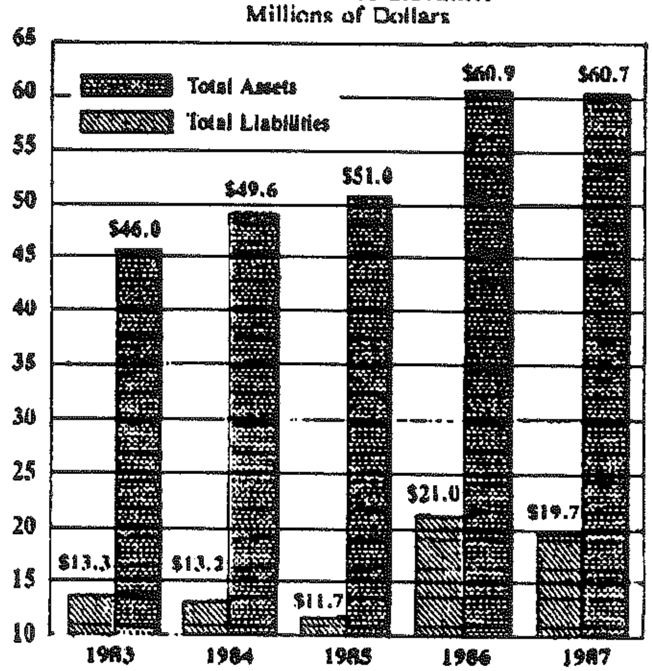
Net Income
Millions of Dollars



Net Income
As % of Sales



Total Assets and Liabilities
Millions of Dollars

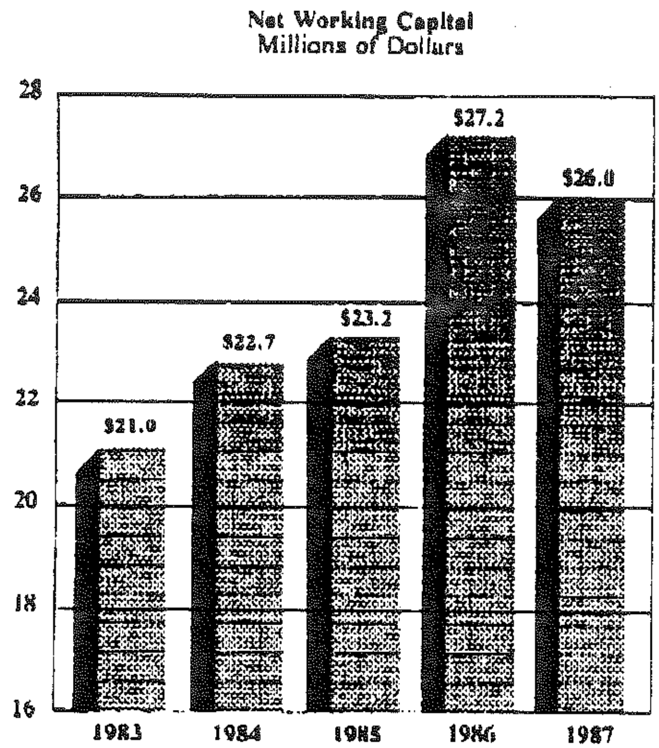


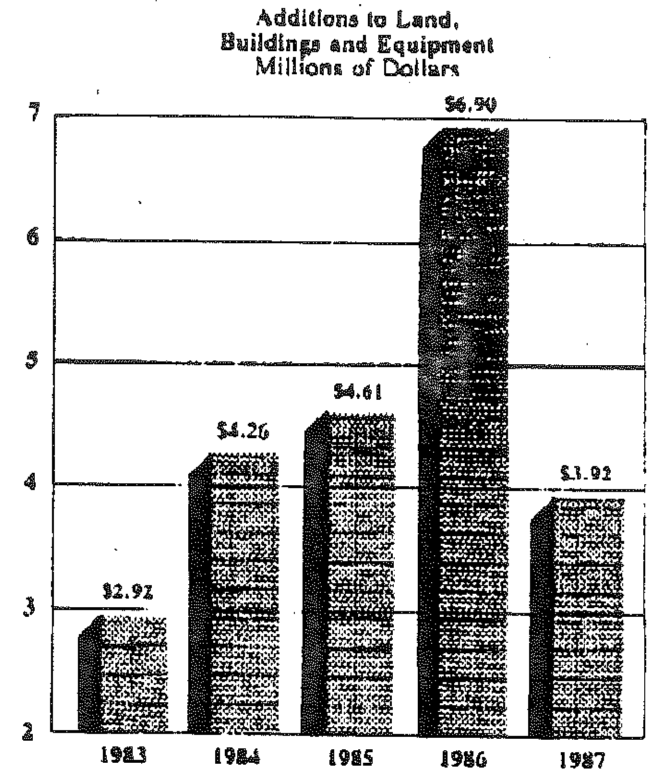
*Net income and net income as a percent of sales for 1984 reflect a deferred income tax reversal of $510,440 or $.32 per share due to a change in the tax law covering Domestic International Sales Corporations.

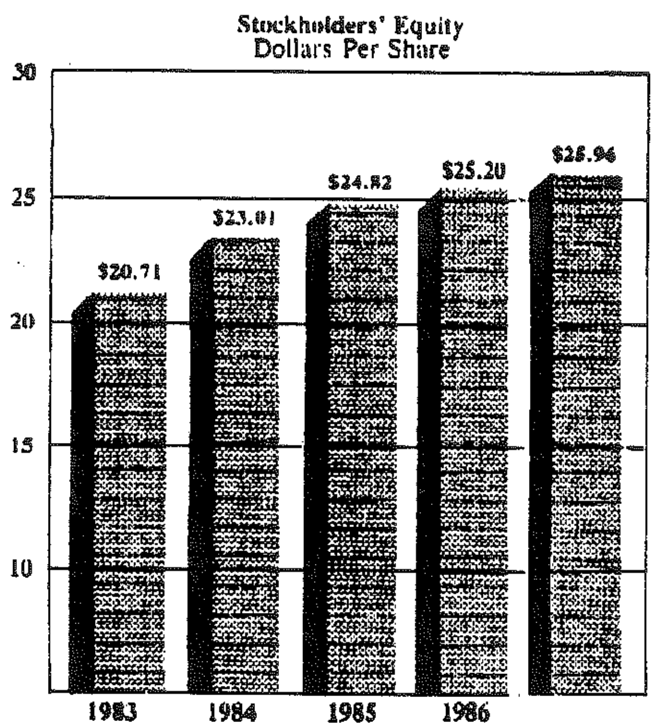
**Net income and net income as a percent of sales for 1987 reflect an income tax credit of $457,704 or $.29 per share which is the cumulative effect of an accounting change to adjust deferred income taxes on the balance sheet to reflect reduced tax rates under the Tax Reform Act of 1986.

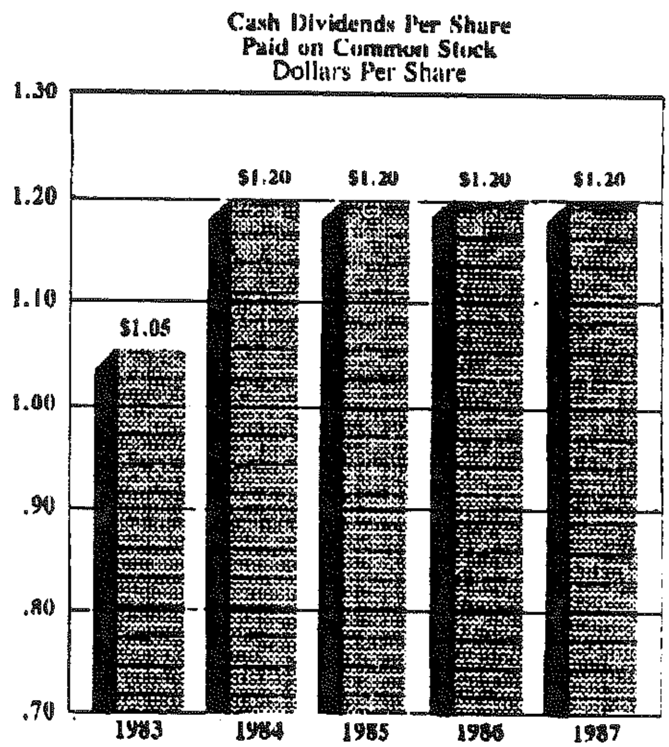
DETREX CORPORATION AND SUBSIDIARIES

5 YEAR HIGHLIGHTS









Amounts per share have been restated to give retroactive effect to the 100% stock distribution, the equivalent of a two-for-one stock split, declared on January 19, 1984 and distributed on February 24, 1984.

PRODUCTS OF DETREX AND DETREX SUBSIDIARIES

INDUSTRIAL CHEMICAL SPECIALTIES DIVISION
26000 CAPITOL AVENUE
REDFORD, MICHIGAN 48239-2499
T. A. McGREGOR, Vice President and General Manager

Immersion Phosphate Coatings—"Perm-Cote"
Industrial Cleaners
Rolling Oils
Spray Phosphate Coatings—"Paintbond"
Metalworking Compounds
Corrosion Preventives
Ultrasonic Phosphate—Hydrasonic
Ultrasonic Conversion Coatings

SOLVENTS DIVISION
P. O. BOX 1398,
ASHTABULA, OHIO 44004
R. J. JONES, Vice President and General Manager

Trichloroethylene—"Perm-A-Clor NA"
Perchloroethylene
1,1,1-Trichloroethane—"Perm-Ethane"
Trichlorotrifluoroethane (Freon TF)
Solvent Reclamation and Waste Management

EQUIPMENT DIVISION
P. O. BOX 5111,
SOUTHFIELD, MICHIGAN 48086-5111
C. B. STOCKMEYER, JR., Vice President and General Manager

Degreasing Equipment
Industrial Ultrasonic Machines
Environmental Emission Control Devices
Electronic Component Cleaning and Defluxing Machines
Soldering Machines
Hospital Ultrasonic Machines
Drycleaning Machines

CHEMICALS DIVISION
P. O. BOX 1398,
ASHTABULA, OHIO 44004
R. J. JONES, Vice President and General Manager

Muriatic Acid
N-Methyl Pyrrole
Pyrrole
Reagent Chemicals—Muriatic Acid, Sulfuric Acid
Nitric Acid

PACIFIC INDUSTRIAL FURNACE DIVISION
P. O. BOX 5111,
SOUTHFIELD, MICHIGAN 48086-5111
R. E. THALACKER, General Manager

Industrial Furnaces for:
Metal Treating
Sintering
Annealing
Hardening
Forging

THE ELCO CORPORATION
P. O. BOX 09168,
CLEVELAND, OHIO 44109
DR. W. T. BRANNEN, Executive Vice President

Chemical Additives for Gear Lubricants, Transmission, Hydraulic and Motor Oils
Industrial Gear Lubricants

HARVEL PLASTICS, INC.
P. O. BOX 757,
EASTON, PENNSYLVANIA 18042
H. G. WISMER, President

Rigid PVC Plastic Pipe
(Normal Impact)
(High Impact)
Solid Bar, Heavy Wall Tubular Stock, Angle Stock, Custom Extrusions

VIKING CHEMICALS, INC.
8 BRUSH STREET,
PONTIAC, MICHIGAN 48053
D. P. ANDERSON, Executive Vice President

Water Treatment Chemicals and Equipment

SEIBERT-OXIDERMO, INC.
16255 WAHRMAN
ROMULUS, MICHIGAN 48174
D. D. HURST, President
Industrial Finishing Materials
Automotive Paints

WAYNE CHEMICAL PRODUCTS COMPANY
9470 COPLAND,
DETROIT, MICHIGAN 48209-2680
L. P. GOWMAN, Executive Vice President

Cutting Fluids
Industrial Cleaners
Drawing Lubricants
Rust Preventives
Fluxes and Solders
Chemical Sealants
Soluble Oils

DIRECTORS
H. GLENN BIXBY
Former Chairman,
Ex-Cell-O Corporation
CHARLES B. BREEDLOVE
Former Executive Vice President
and Director of Reichhold
Chemicals, Inc.
BRUCE W. COX
President, B. W. Cox Company,
Manufacturers Representative
ROBERT A. EMMETT, III
Partner Reed Smith Shaw & McClay,
Attorneys, Washington, D.C.
T. KENNETH HAVEN
Director
LOUIS SCHLOSSBERG
President
ARBIE O. THALACKER
Chairman of the Board
ARBIE R. THALACKER
Partner, Shearman & Sterling,
Attorneys, New York City

OFFICERS
L. SCHLOSSBERG
President
W. T. BRANNEN
Vice President
L. P. GOWMAN
Vice President
R. J. JONES
Vice President
T. A. McGREGOR
Vice President
C. B. STOCKMEYER, JR.
Vice President and Treasurer
F. J. CHMIELNICKI
Secretary
F. X. GALLANT
Controller and Assistant Secretary
E. R. RONDEAU
Assistant Controller

AUDIT COMMITTEE
H. GLENN BIXBY, Chairman
CHARLES B. BREEDLOVE
T. KENNETH HAVEN

TRANSFER AGENT AND REGISTRAR
NATIONAL BANK OF DETROIT

AUDITORS
DELOITTE HASKINS & SELLS

DETREX CORPORATION
GENERAL OFFICES - 4000 TOWN CENTER, SOUTHFIELD MICHIGAN
MAILING ADDRESS - P.O. BOX 5111, SOUTHFIELD, MI 48086-5111
Telephone: (313) 358-5800

J

SECTION J

ENVIRONMENTAL ASSESSMENT

TABLE OF CONTENTS

Page

SECTION J
ENVIRONMENTAL ASSESSMENT

LIST OF TABLES

LIST OF ATTACHMENTS

SECTION J

ENVIRONMENTAL ASSESSMENT

This section of the operating license application provides an environmental assessment on the hazardous waste container storage area design and operation as required by Michigan Act 64 Rule 299.9504(1)(e).

J-1 NEED FOR AND OBJECTIVE OF EXISTING FACILITY

The Detrex Corporation Gold Shield Solvents facility specializes in the sale of halogenated hydrocarbon solvents and cleaning equipment and the collection of solvent wastes generated in degreasing and other cleaning operations.

The hazardous waste operation of the Gold Shield Solvents facility consists of a hazardous waste container storage area used to store drummed solvent wastes prior to the transfer of these wastes to an off-site Detrex reclamation (recycling) facility or to an off-site treatment/disposal facility. The container storage area is enclosed within a building that provides a safe and sound storage area for the wastes.

The container storage area in Grand Rapids is an important unit in the Detrex solvent recovery (recycling) operation, providing storage of an adequate volume to economically transport the wastes to an off-site reclamation (recycling) facility. The off-site solvent recovery (recycling) operation, operated by Detrex, provides an essential service to all Detrex customers for the safe handling of their solvent wastes.

J-2 DESCRIPTION OF EXISTING ENVIRONMENT

The Gold Shield Solvents facility is located in Grand Rapids, Michigan at 312 Ellsworth Avenue. The site location is shown in Attachment J-1.

The following sections provide a description of the existing environment in the vicinity of the Gold Shield Solvents facility. Attachment J-2 provides a list of references used in preparing this environmental description.

J-2a Physiography

J-2a(1) Topography

The surface topography in southwestern Michigan was greatly affected by the Wisconsian glaciation of the late Pleistocene Epoch. The region exhibits many glacial features including various recessional moraines, lake plains, outwash plains and outwash channels.

During the latter part of the Wisconsian glaciation, southwest Michigan was influenced by two retreating ice lobes. Differing rates of recession resulted in various degrees of development of the surficial deposits. In total, five major end moraines can be evidenced in southwestern Michigan. As recession began, an interlobate moraine was produced by both the Saginaw and Michigan ice lobes. Continued recession resulted in the formation of four more major end moraines; two by the Saginaw ice lobe and two by the Michigan ice lobes.

Kent County, wherein the Gold Shield Solvents facility is located, is comprised of the various glacial features mentioned above. In southwest Kent County, the Lake Michigan-Saginaw Interlobe tract reaches an elevation of 1,032 feet above mean seal level at Dias Hill (just SW of the Grand Rapids International Airport). At such an elevation, this interlobe structure stands more than 100 feet above the other area moraines. West of the interlobe, elevations generally decrease with the presence of smaller moraines, extensive outwash plains, and outwash channels. Low lying areas are occupied by marshes and rivers.

The Gold Shield Solvents facility area lies at an elevation of approximately 605 feet above sea level. Just west of this facility is the Grand River which is at an elevation of 590 feet above sea level. A substantial ridge runs north and south between the Gold Shield facility and the river. The topography to the east of the ridge slopes downward towards the Gold Shield Solvents facility and the nearby expressway.

J-2a(2) Geology

The Gold Shield Solvents facility is situated on an assortment of stratified outwash deposits. Borings which were conducted in the vicinity of the plant in July 1984, indicated a variety of deposits in the upper 25 feet of the overburden (EDI, 1985). Close to ground surface, five to eight feet of fill covered a zone of four to eight feet of silty clay. However within this clay zone existed isolated pockets of sand and black cinder. Beneath the clay zone, a three to five foot zone of fine sands was found. Beyond the fine sands, exists a zone of coarse to fine sands and gravels to a depth of 25 feet. The overall depth of the overburden was not determined at the time of drilling.

The overburden, composed of various sandy deposits, represents good aquifer potential for water supplies. In 1981, Kent County recorded 18 wells within the glacial drift aquifers (USEPA 1981). Cedar Springs, Grand Rapids Township and Wyoming Township reported water wells located within the glacial drift deposits with supply capacities as high as 1,000 gpm.

Beneath the above mentioned glacial drift overburden, lies a sequence of important bedrock formations. The downward sequence of the various formations include the following:

Pennsylvanian Period

Saginaw Formation

The shallowest bedrock formation, the Saginaw, is an important aquifer in much of the central and eastern parts of the Lower Peninsula. This formation is characterized as being primarily sandstone and siltstone with interbedded layers of shale, limestone, coal and gypsum. Naturally with these materials, there exists a wide range of porosities for this unit. The lenticular shaly sandstones tend to have a low effective porosity whereas the clean sandstone bodies have a much higher effective porosity. As a water supply aquifer, the Saginaw formation has a very good yield mainly in the upper portions of the unit. The transmissivity of the Saginaw is greater in the upper portions of the unit primarily due to increased fracturing at the bedrock surface. Transmissivities range anywhere from 9,520 gpd/ft to 37,156 gpd/ft.

Mississipian Period

Bayport Limestone

The Bayport conformably overlies the Michigan Formation. Upon deposition, the Bayport was dissected by erosional processes before deposition of the Saginaw Formation had taken place. In the upper portions of this unit, dolomite and limestone are the main materials. At deeper elevations however, the limestone becomes more shaly in nature and more fossiliferous. The basal portion of this unit is generally quite dense, cherty, combined with interbeds of quartz sandstone and anhydritic dolomite. Due to the non-porous nature of some of the carbonate units, this formation is not viable as an aquifer within Kent County. Alternatively, due to the presence of some sandstone beds within this unit, the effectiveness of this formation as a confining unit is also questionable.

Michigan Formation

This formation can be characterized by a sequence of dark gray shales, limestone dolomite, sandstone, gypsum and anhydrite. Although this unit is used as a water bearing unit for small quantities of water, it is not regarded as a good aquifer. The small isolated sandstone layers are capable of producing only small quantities of water whereas on the other hand, the shale, gypsum and anhydrite sub-units are very useful as confining layers. No transmissivity value is available for this formation.

Locally in Grand Rapids, this unit is mined for its gypsum content.

Marshall Sandstone

The Marshall Sandstone is not only one of the most productive aquifers in the state, it is also the most utilized bedrock aquifer in Kent County. The formation is composed of siltstone to fine to medium-grained sandstone. The recharge to this unit is primarily through overlying glacial and lacustrine deposits towards the east. As an aquifer, this unit is capable of supplying great quantities of water to a number of wells which penetrate this formation. Water wells within this unit have reported capacities of 325, 500, 350 and 602 gpm in the respective townships of: Byron, Paris, Walker and Wyoming.

Coldwater Shale

The Coldwater Shale in southwest Michigan is gray, micaceous in texture, and approximately 500 feet in thickness. In general, this formation is not recognized as a good aquifer due to is low effective porosity. However despite the poor classification as an aquifer, the Coldwater Shale is used as a water supply source in nearby Marcaibo Shores, Michigan. Locally at Marcaibo Shores, the transmissivity of the Coldwater Shale was documented as 26,700 gpd/ft.

J-2a(3) Soils

Stratigraphic information gained from borings near the Gold Shield facility in Grand Rapids (EDI, 1986), revealed the presence of two main soil categories. The two soil units in the vicinity of the facility include: the Plainfield - Oshtemo - Spinks Association and the Houghton - Cohoctah - Ceresco Association (United States Department of Agriculture, 1986).

Close to ground surface, the Houghton - Cohoctah - Ceresco Association is most predominant. Within this association, the Houghton and Cohoctah soils are typically poorly drained and are formed in loamy alluvial deposits. These soils are commonly founded on flood plains, along the major streams, rivers, and in basin like areas. The Ceresco soils, on the other hand, are the most permeable. Subsurface Ceresco soils often contain lenses of brown, mottled, friable fine sandy loam. At greater depths, the underlying material is normally characterized by brown, mottled, loose gravelly sand and grayish brown, stratified fine sand, very fine sand and silt. This description was similar to the stratigraphy identified at the Gold Shield site.

Despite the permeable soils found at surface, EDI (1985) discovered a clay confining layer at approximately 8 feet below ground surface. Several permeability measurements conducted by EDI on the clay stratum, revealed permeabilities in the range of 10^{-8} cm/sec.

At greater depths (approximately 10-15 feet) the main soil unit is the Planfield - Oshtemo - Spinks Association. Within this association, the Plainfield and Spinks soils are normally composed of grayish, brown or yellowish, brown loose sand. The Oshtemo soils can have coarse gravelly sand. Such soils were encountered in borings from 15-25 feet below ground surface (EDI, 1985). The Plainfield - Oshtemo - Spinks Association is regarded as a well drained soil type.

The area where the Gold Shield facility is located has been assigned a land capability classification of urban lands. As such, 80% of the ground surface is covered by streets, parking lots, driveways, sidewalks, office buildings, housing units, and industrial parks.

J-2b <u>Climate</u>

Since Grand Rapids, Michigan is located in the west-central part of Kent County some 30 miles west of Lake Michigan, the climatic patterns in this area are strongly influenced by the natural climatic patterns of the lake (NOAA 1988). In spring, the lake cools the area and helps retard pre-mature vegetative growth which prevents frost damage. Conversely in the fall, warmer temperatures from the lake prolong the effective growing seasons. During the winter, excessive cloudiness and numerous snow flurries occur as a result of strong westerly winds.

Summer days are normally pleasantly warm although extended periods of hot, humid weather are common during most summers. July is normally the sunniest month with a mean temperature of 71.4°F. The highest historic recorded temperature was 100° F in August 1964.

During the period from November to January, a period of excessive cloudiness is normally exhibited. In this period, December days normally reflect the least amount of sunshine. Mean low temperatures for December and January are 27.3°F and 22.0°F, respectively. The lowest record temperature was -21°F in January 1979.

Precipitation is usually ample for growth and development of all vegetation. About one-half of the annual precipitation falls during the May to September growing season. Droughts do occur occasionally, however they are seldom of protracted length. During the growing season, an average monthly rainfall of three inches is common. A high precipitation level of 11.85 inches (September 1986) and a low precipitation level of 0.14 inches (August 1969) have been documented. Monthly maximum snowfall was recorded in January 1979 at 45.5 inches.

November is one of the windiest months and although violent windstorms are infrequent, gusts have on occasion exceeded 65 mph. Summer thunderstorms occasionally produce gusty winds over 60 mph.

J-2C <u>Terrestrial Systems</u>

The Gold Shield Solvents facility is located on a at 312 Ellsworth Avenue in Grand Rapids, Michigan. This is primarily an industrial area.

For the purpose of providing an accurate detailed survey of the flora and fauna in the area surrounding the facility, Detrex contracted the firm Environmental Consultants, Inc. of Rochester, Michigan to conduct a site survey. This report, prepared by an experienced biologist, entitled "Terrestrial Systems, Detrex Corporation Gold Shield Solvents Facility, Grand Rapids, Michigan", is included as Attachment J-3.

J-2d Aquatic Systems

The West-Central region of Michigan has many inland lakes and rivers. Within the counties of Lake, Montcalm, Newaugo and Kent, there are a total of 1,139 lakes which cover an area of 85,334 acres (USEPA 1981). The Michigan Department of Natural Resources has classified many of these lakes (73 percent) as warm water lake bodies. This is the largest number of warm water lakes within any region and accounts for 19 percent of the total for the State of Michigan. Within Kent County, where the Gold Solvents facility is located, there are 186 lakes of greater than five acres in surface area. The total area encompassed by the lakes in Kent County is 9,350 acres.

The main body of water which affects Grand Rapids, Michigan is the Grand River. The Grand River which is Michigan's largest stream bisects Grand Rapids into two parts, east and west. The Gold Shield facility is located within half a mile of the river.

The Grand River gathers water from the Grand River basin which is the second largest river basin in the State. It covers an area of 5,572 square miles of relatively level to hilly country (USGS 1986). The main artery of the Grand River rises near the State's southern boundary at an elevation of 1,040 feet above sea level, flows northward for 70 miles and then westward for another 190 miles until it flows into Lake Michigan at an elevation of 580 feet. At Grand Rapids, the watershed area is estimated at 4,900 square miles. Tributary rivers to the Grand inlcude: the Portage, the Red Cedar, the Looking Glass, the Maple, the Flat, the Thornapple and the Rogue. The basin contains more than 300 lakes; the largest being Center Lake with an area of 1,000 acres. The basin is generally underlain by glacial deposits except for a few small areas in the headwaters and a short stretch at Grand Ledge where sedimentary rocks are exposed.

During the early 1800's much of the basin was covered with a forest of mixed hardwoods. Today however, only 15 percent of the basin is wooded, mostly along watercoarses and in hilly lands; the rest of the basin consists of farmland and urbanized areas. Based on a 1980 census, populations within cities in the basin include: Grand Rapids, 320,000; Lansing, 195,000; Jackson, 50,000; and Grand Haven, 12,000. Some salmon were introduced into the Grand River some years ago and, by the early 1980's had progressed upstream to the Lansing area.

The average slope of the Grand River is 1.8 feet/mi. Average discharge from the river at Grand Rapids during the past 50 years has ranged from 1,500 ft.^{3}/s. to 6,300 ft^3/s however flow rates may vary both seasonally and from year to year. The Grand River reaches critical heights a couple times every year, generally once in January-February and again in March-April. During these seasonally high runoff events, the river overflow is limited to the lowlands of the flood plain. Records from river level monitoring at Grand Rapids also indicate a minimum discharge of 381 ft^3/s in 1936 and a record flood in 1904 when discharges were 54,000 ft^3/s. In general, there is very little regulation of water flow. Only minor diurnal fluctuations occur at Grand Rapids due to regulation by upstream power plants.

The major uses of surface water from the Grand River are recreation, power generation and as a waterbody for discharge of community wastewater from treatment plants. Downstream near the river mouth and upstream, most communities utilize the river for recreation and wastewater discharge; upstream from Lansing, the river is used for power production. Close to the river mouth, many communities draw water from Lake Michigan whereas upstream communities tend to use the groundwater resource. Once this water has been processed it is often returned to the river, increasing the flow. For example, in the Lansing area, wastewater added to the Grand and Red Cedar Rivers averaged 59 ft^3/s or 38 Mgal/d - a significant volume during low flow periods.

Despite the discharges to the river, the quality of water is generally suitable for most purposes. A water sample collected in September 1983 from the Grand River about 20 miles upstream from the mouth contained the following major constituents: calcium, 59 mg/L; magnesium, 23 mg/L; sodium, 29 mg/L; sulfate, 50 mg/L; chloride, 47 mg/L; hardness (as $CaCo_3$), 242 mg/L; and dissolved solids, 329 mg/L. Suspended sediment was 38 mg/L at a discharge rate of 1,590 ft^3/s (USGS 1986).

J-2e Hydrology

In the west-central region of Michigan, water supply for rural, industrial and domestic consumption comes from both surface and groundwater sources. In close proximity to Lake Michigan, the main source of water comes from the lake. Further inland however, many communities and industries depend on the use of groundwater and only a small number of inland communities use surface water as a source. Table J-1 describes the source of water for various communities within Kent County.

TABLE J-1

SOURCE OF MAJOR COMMUNITY WATER SUPPLIES IN KENT COUNTY

Community	Drift Aquifers	Bedrock Wells	Drift & Bedrock Wells	Surface Water	Purchased	Unspecified
	SOURCE					
Grand Rapids				X		
Wyoming				X		
Kentwood					X	
Walker					X	
East Grand Rapids					X	
Grandville					X	
Lowell			X			
Rockford				X		
Cedar Springs	X					
Others	10	1	1	0	4	1
Total # of Supplies	11	1	2	3	8	1

NOTES:

* Indicates the presence of standby wells.
Source: USEPA, 1981.

Within the west-central region of Michigan, Kent County is one of the major users of groundwater. State wide, Kent County ranks third in the number of wells with a total of 11,511 registered installations (based on 1981 data). This figure accounts for 5.3 percent of all the water wells within the State of Michigan. Cascade Township which is located southeast of the City of Grand Rapids has the highest density of wells at 31 wells per square mile (1,135 wells in total).

The water supply wells in Kent County draw water from a number of geologic formations. One of the best producing formations is the overburden unit. The overburden unit is composed of sands, gravels and silts which are typical glacial outwash features. (Refer to geology and soils section for greater detail.) Table J-2 summarizes a limited data set for some of the water wells within Kent County. Many of the wells which are located in the glacial drift are capable of producing substantial quantities of water. The material properties allow for the high transmissivities values which are reported for this formation. Transmissivity values as high as 100,000 gpd/ft have been reported. The water quality from the overburden is also quite good as seen in Table J-3 which represents the water quality of 12 different community water systems developed in the glacial drift aquifer. Table J-3 indicates that nitrate, flouride, chloride and sulfate concentrations are below the USEPA drinking water standards. Iron and TDS do on occasion exceed the environmental guidelines.

The bedrock formations are also used as a source of water within Kent County. All of the various formations which are detailed in the geology section of this report, are utilized as a groundwater source. As shown in Table J-2, from a limited number of wells, it is obvious that the various formations are good sources for abundant water. The water quality of three sampled community systems as shown in Table J-4, indicates that the concentrations of nitrate, fluoride, chloride and sulfate are all below acceptable drinking water standards. On occasion, TDS and iron concentrations exceed the environmental quidelines.

However despite the wide occurrence of water wells within Kent County and the apparent suitability of groundwater resources, there are not any water wells within the immediate vicinity of Gold Shield Solvents facility of Grand Rapids. As shown in Table J-1, the City of Grand Rapids draws its source of water from a surface source. The principal source of water which supplies the City comes from Lake Michigan. In 1982, Grand Rapids removed on average 38 Mgal/day (59 ft^3/s) from Lake Michigan and an additional 2 Mgal/day (3 ft^3/s) from the Grand River (Bedell 1982). These sources of water are also believed to supply nearby communities of Wyoming, Kentwood, Walker, East Grand Rapids and Grandville.

TABLE J-2

HYDRAULIC CHARACTERISTICS OF
WATER WELLS IN KENT COUNTY

LOCATION	#OF WELLS	DEPTH (FT.)	WELL CAPACITY	FORMATION
Adatowne	3		88-120	Glacial drift
Cedar Springs	2	47-90	715-1016	Glacial drift
Lowell	3			Glacial drift
	2	103-108	108-946	Glacial drift
	2	47-71	120-800	Glacial drift
	1	107	800	Saginow
Rockford	1	20	100	Glacial drift
Sparta	3		300-500	Glacial drift
	1	88	490	Glacial drift
	1	280	250	Bayport
Maracaibo Shares	1	235		Coldwater
Alpine Twp	1	137	291	Glacial drift
Algona Twp.	1	377	50	Bayport
Bowne Twp.	1	47	199	Glacial drift
Byron Twp.	1	60	5	Glacial drift
	3	132-215	30-325	Marshall
Byron Center	1	271	180-200	Marshall
Canon Twp.	1	152	970	Glacial drift
	2	65-151	12-25*	Glacial drift
Cascade Twp.	1	106	322	Glacial drift
	1	180	465	Glacial drift
	3	50-159	60-239	Glacial drift
	1	212	10*	Marshall
Courtland Twp.	1	132	400	Glacial drift
Gaines Twp.	1	230	45*	Marshall
Grand Rapids Twp.	2	100-230	700-400	Glacial drift
Delson Twp.	1	41	2*	Glacial drift
Oakfied Twp.	1	300	1200	Glacial drift
Paris Twp.	4	262-325	30-500	Marshall
Plainfield Twp.	1	98	910	Glacial drift
	1	137	350	Glacial drift
	3	212-252	500-1180	Bayport
Sparta Twp.	1	68	243	Glacial drift
	1	280	250	Bayport
Walker Twp.	2	50-120	240-500	Glacial drift
	1		320	Glacial drift
	1	212	500	Bayport
	1	245	35	Michigan
	2	322-340	200-350	Marshall
Wayland Twp.	1		175	Michigan
Wyoming Twp.	1	73	1000	Glacial drift
	1	202	602	Marshall

Notes:

* Indicates flowing wall.
Source: USEPA, 1981

TABLE J-3

WATER QUALITY SUMMARY OF COMMUNITY
WATER SYSTEMS DEVELOPED IN THE GLACIAL
DRIFT AQUIFER IN KENT COUNTY

Parameter	EPA Maximum Contaminant Level	Range	Mean	Standard Deviation
Nitrate	10.0 mg/L	0.0 - 3.1	0.6	0.9
Fluoride	3.40 mg/L	0.00 - 0.90	0.24	0.22
Chloride	250 mg/L	1 - 85	10	17
Iron	0.30 mg/L	0.00 - 2.10	0.40	0.45
Sulfate	250 mg/L	0 - 200	46	37
Total Dissolved Solids	500 mg/L	206 - 509	314	66
Specific Conductance	850 umhos	300 - 755	494	106

Notes:

Water Analyses from Drift Aquifer based on:
Number of water systems - 12
Number of wells sampled - 26
Number of samples analyzed - 41

- source: USEPA, 1981

TABLE J-4

WATER QUALITY SUMMARY OF COMMUNITY WATER SYSTEMS DEVELOPED IN BEDROCK FORMATIONS IN KENT COUNTY

Parameter	EPA Maximum Contaminant Level	Saginow Formation Range	Saginow Formation Mean	Bayport Formation Range	Bayport Formation Mean
Nitrate	10 mg/L	0.0 - 0.0	0.0	0.0 - 0.0	0.0
Fluoride	2.4 mg/L	0.00 - 0.21	0.15	0.30 - 0.32	0.31
Chloride	250 mg/L	1 - 14	7	4 - 6	5
Iron	0.30 mg/L	0.00 - 2.70	1.11	0.10 - 1.32	0.71
Sulfate	250 mg/L	70 - 172	134	41 - 59	50
Total Dissolved Solids	500 mg/L	350 - 523	442	370 - 353	332
Specific Conductance	850 umhos	600 - 748	671	535	535

Notes:

Water Analyses from Saginow Formation based on:
- Number of water systems - 2
- Number of wells sampled - 3
- Number of samples analyzed - 5

Water Analyses from Bayport Limestone based on:
- Number of water systems - 1
- Number of wells sampled - 2
- Number of samples analyzed - 2

- source: USEPA, 1981

Although there is information available on the geological formations close to the Gold Shield Solvents Site, with the exception of one report by EDI Engineering and Science very little hydrogeologic information is known to exist. A brief investigation conducted by EDI Engineering and Science indicates that the static groundwater level beneath the Gold Shield facility is deeper than 25 feet below ground surface (approximately at an elevation of 580 ft. amsl). Within the immediate vicinity of the Site, beside the Grand River, groundwater levels are known to oscillate between 590-595 ft. amsl. Groundwater elevations on the ridge in between the plant and the river are documented between 600 and 605 ft. amsl (EDI, 1985). Based on this water level data, the groundwater flow direction is probably in an easterly direction. This direction of groundwater flow may be primarily due to drainage facilities to the east and north of the site. Within the vicinity of the Site, contamination of soils due to other potential sources has been documented. (EDI 1985).

J-2f <u>Air Quality</u>

The Gold Shield Solvents facility is an existing industrial operation in a light industrial zone within Grand Rapids. A Grand Rapids air quality summary that was taken from the Michigan Department of Natural Resources "Air Quality Report - 1986", outlines air quality from 1979 to 1986 and is presented below.

> The total suspended particulate sampling network in the Grand Rapids area consists of seven samplers. Grand Rapids has demonstrated compliance with annual and 24-hour primary standards for well over ten years. Since 1979, the 24-hour secondary standard has also been met.
>
> A PM10 monitor, one which measures particulate matter 10 microns or less, operates at the Grand Rapids downtown water pumping station monitoring location. The annual arithmetic mean for January through December was 31 ug/m^3.
>
> As in the previous years, the continuous analyzers for sulfur dioxide and carbon monoxide located in downtown Grand Rapids have recorded levels below the established standards.
>
> Two ozone monitoring sites operated in Kent County in 1986: one in downtown Grand Rapids and the other at a site located approximately 15 miles northeast of the Grand Rapids urban area. Neither site recorded an excursion of the .12 ppm standard in 1986. Both sites recorded excursions

of the .12 ppm ozone standard in 1985. During 1984, only the downtown Grand Rapids site recorded an excursion of the standard. During 1983, both sites again recorded excursions of the ozone standard. The downtown site alone exceeded the standard in 1982, and no excursions were recorded at either site back to 1979.

The analysis for lead at two sites in Grand Rapids indicated the sites met the calendar-quarter lead standard, as in the past six years. One site is a roadway site, installed along an expressway in 1981, designed to record high concentrations of lead.

A monitoring stations map has been included as Attachment J-4 and the most recently published (1986) air quality data has been summarized on Table J-5.

J-2g Aesthetics

The area in which the Detrex Corporation Gold Shield Solvents facility is located is an industrial area of Grand Rapids. The aesthetic value of this area is somewhat limited.

The facility is not a source of unreasonable noise or other nuisance factors. The amount of truck traffic to and from this facility is not inconsistent with other industries in the area. Traffic information, in relation to the movement of hazardous wastes, is discussed in Section B of this operating license application.

J-2h Land Use

Existing land use and zoning in the site area is shown on Attachment J-5. The facility is located in a light industrial district (I-1) adjacent to the central business district zone (CBD-4).

J-2i Archaeological and Historical Resources and Site

The Gold Shield Solvents facility is an existing industrial operation in an industrial area. The site is currently being reviewed by representatives of the Michigan Department of State, Michigan History Division. The result of their review will be amended to the operating license application when available.

TABLE J-5
1986 SUMMARY OF AIR QUALITY
GRAND RAPIDS, KENT COUNTY

LEAD (Concentrations in ug/cubic meter)

SITE NUMBER	SITE LOCATION	MONTHS SAMPLED	1ST QUARTER SAMPLES	1ST QUARTER AVERAGE	2ND QUARTER SAMPLES	2ND QUARTER AVERAGE	3RD QUARTER SAMPLES	3RD QUARTER AVERAGE	4TH QUARTER SAMPLES	4TH QUARTER AVERAGE	EXCEEDED STANDARD
9	Wood TV College & Cherry SE	Jan. - Dec. (Daily)	15	0.07	15	0.06	13	0.04	15	0.04	0

NITRATE (Concentration in ug/cubic meter)

SITE NUMBER	SITE LOCATION	NO. OF SAMPLES	MAXIMUM 24 HOUR SAMPLE	2ND HIGH 24 HOUR SAMPLE	3RD HIGH 24 HOUR SAMPLE	4TH HIGH 24 HOUR SAMPLE	ANNUAL ARITH. MEAN
24	Coldbrook Pumping Station 1179 Monroe NW	57	11.8	11.0	9.7	9.7	4.7

TABLE J-5
1986 SUMMARY OF AIR QUALITY
GRAND RAPIDS, KENT COUNTY

SUSPENDED PARTICULATES (concentrations in ug/cubic meter)

SITE NUMBER	SITE LOCATION	MONTHS SAMPLED	NO. OF SAMPLES	MAXIMUM 24 HOURS	2ND HIGH 24 HOUR	3RD HIGH 24 HOUR	ANNUAL GEO. MEAN	STANDARDS EXCEED PRIMARY & 24 HOUR	STANDARDS EXCEED SECONDARY 24 HOUR
6	Old Gas Company Building 509 Wealthy	Jan. - Dec.	61	107	103	99	51	0	0
9	Wood TV College & Cherry Street	Jan. - Dec.	59	88	70	69	35	0	0
24	Coldbrook Pumping Station 1179 Monroe NW	Jan. - Dec.	57	97	96	96	47	0	0
27	East G.R. High School 2211 Lake Dr., S.E.	Jan. - Dec.	61	93	66	64	31	0	0

CARBON MONOXIDE (concentration in mg/cubic meter)

SITE NUMBER	SITE LOCATION	MONTHS SAMPLED	NO. OF SAMPLES	MAXIMUM 1 HOUR	2ND HIGH 24 HOUR	MAXIMUM 8 HOUR	2ND HIGH 8 HOUR	MAXIMUM 24 HOUR	ANNUAL ARITH. MEAN	STANDARDS EXCEED PRIMARY & 1 HOUR	STANDARDS EXCEED SECONDARY 8 HOUR
24	Coldbrook Pumping Station 1179 Monroe NW	Jan. - Dec.	8564	29.1 (25.32)	19.5 (16.97)	7.3 (6.32)	6.0 (5.20)	3.7 (3.20)	0.9 (.74)	0	0

OZONE (Concentrations in ppm)

SITE NUMBER	SITE LOCATION	MONTHS SAMPLED	NO. OF SAMPLES	HIGHEST DAILY MAXIMUM	2ND DAILY MAXIMUM	3RD DAILY MAXIMUM	4TH DAILY MAXIMUM	STANDARDS EXCEED PRIMARY & SECONDARY DAILY
24	Coldbrook Pumping Station 1179 Monroe NW	Apr. - Oct.	4981	0.120	0.120	0.116	0.115	0

...continued

J-2j <u>Socio-Economic Environment</u>

The City is a large metropolitan city encompassing a very large land area and a population estimated to be approximately 200,000 people.

The Detrex Corporation facility should not have any direct effect on any aspect of the local economic environment. The facility should not have any direct impact on local support systems such as school taxes, sewage disposal, or public utilities. Local police, fire and hospital officials have been given copies of the contingency plan for the facility to assure proper response procedures in the unlikely event of a major incident at the facility. Small incidents can be handled by in-house emergency procedures.

The service of solvent recovery (recycling) offered by Detrex actually reduces the potential hazardous waste loading at waste disposal systems. Only a small portion of the hazardous waste material stored at the Grand Rapids facility is disposed/treated of as hazardous waste after the material has been processed through the off-site solvent recovery operation.

J-3 ALTERNATIVES CONSIDERED

Hazardous wastes are not generated at the Grand Rapids Gold Shield Solvents facility. Wastes are typically received in 55-gallon drums from off site. The only feasible storage facility that could be used at the facility is a container storage area.

It is not cost-effective for Detrex to ship wastes off site to the recovery (recycling) facility as they are received. Therefore, storage of wastes is required in order to accumulate sufficient volume of solvent waste prior to transporting. The only other alternative to a container storage area is tank storage. Tank storage would provide the same service; however, the waste material would have to be transferred from drums to tanks at the Grand Rapids facility and then pumped into a tanker prior to shipment off site. This adds extra handling operations that are not required with a container storage area.

The storage of hazardous waste materials in the container storage area located inside the enclosed building allows Gold Shield Solvents to manage the wastes in the safest possible way. Careful operation of the storage area should eliminate the potential of an environmental impact to the surrounding area.

J-4 ANTICIPATED ENVIRONMENTAL IMPACT OF THE EXISTING FACILITY

The container storage area is located within an enclosed building that provides adequate secondary containment. It is relatively free of the potential for negative impacts on topography, geology, climate, air quality, aesthetics, land use, archaeological, historical and social resources in the area.

J-4a Potential Secondary Impacts

The only potential for off-site secondary impacts to occur would be a result of mismanagement of operations that is considered under the failure mode assessment presented in a following section.

J-4b Environmental Review

The facility has been designed to minimize any potential impacts on the environment. Existing management operations and response procedures have also been designed to minimize potential impacts on the environment.

J-5 UNAVOIDABLE ADVERSE IMPACTS

There will be negligible adverse impacts from the operation of the container storage area, assuming attention is paid to site security, routine inspection and maintenance, proper containment of waste materials, and strict adherence to all applicable State and Federal regulations.

J-6 MITIGATING MEASURES

All feasible alternatives for the temporary storage of hazardous wastes at the facility have been considered. No other mitigating measures are available. The container storage area itself is a mitigating measure that reduces the potential of a loss of hazardous waste to the environment.

J-7 FAILURE MODE ASSESSMENT

J-7a Description of System

The Detrex Corporation Gold Shield Solvents hazardous waste handling system consists of receiving drummed solvent wastes generated in degreasing and other cleaning operations, storing the wastes in a secure container storage area within the single enclosed building, and transferring the solvent wastes to an off-site Detrex solvent recovery (recycling) operation or to an off-site permitted treatment/disposal facility.

J-7b Definition of Failure

A failure within the container storage area could occur as a leakage of liquids from the drums.

J-7c Possible Causes of Failure

The potential failure mode could occur from drums of poor structural integrity, or drums that are accidentally punctured or in some other manner damaged during handling operations.

J-7d Methods for Detection of Failure

The possible modes of failure presented above would all be detected during regular inspections of the container storage and secondary containment areas. Plant personnel are in or near the container storage area during all plant operating hours.

The facility inspection schedule is presented in more detail in Section F of this operating license application.

J-7e Environmental Effects of Failure

The possible mode of failure presented in previous sections could cause a release of hazardous waste onto the facility floor and secondary containment area in the enclosed structure. The secondary containment area is constructed of concrete.

J-7f Possible Corrective Actions in the Event of Failure

A detailed description of the response actions that will be implemented in the event of a failure is presented in Section G (Contingency Plan) of this operating license application. Procedures to prevent the occurrence of hazards are described in Section F (Preparedness and Prevention Procedures).

In summary, the Preparedness and Prevention Procedures (Section F) addresses the following:

- Security
- Inspection requirements and schedule
- Emergency equipment
- Emergency prevention

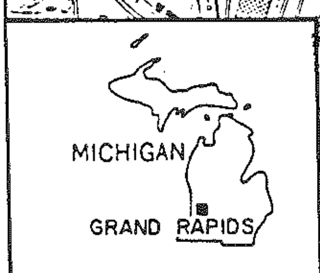
The Contingency Plan addresses the following:

- Emergency Coordinators
- Notification, identification and assessment
- Control procedures
- Response Procedures
- Emergency procedures
- Evacuation plan

ATTACHMENT J—1

ATTACHMENT J-1

SITE LOCATION



CRA

SITE LOCATION
Detrex Corporation
Gold Shield Solvents, Grand Rapids

2471-27/10/88-6-D-0

ATTACHMENT J—2

ATTACHMENT J-2

LIST OF REFERENCES

ATTACHMENT J-2

LIST OF REFERENCES

1. Bedell, D.J., 1982. Municipal water withdrawal in Michigan: Michigan Department of Natural Resources, Water Management Division.

2. EDI Engineering and Science, 1986. Reports: Results of Investigation of Soil Quality for Gold Shield Solvents Division of Detrex Chemical Industries Grand Rapids, Michigan.

3. EDI Engineering and Science, 1985. Work Plan for a Soils Contamination Investigation for Gold Shield Solvents. Grand Rapids, Michigan.

4. NOAA, 1988. Local Climatological Data, Annual Summary with Comparative Data for Grand Rapids, Michigan. National Oceanic and Atmospheric Administration.

5. United States Department of Agriculture, 1986. Soil Survey of Kent County, Michigan by US Department of Agriculture Soil Conservation Service.

6. USEPA, 1981. Hydrogeology for Underground Injection Control in Michigan: Part 1, United States Environmental Protection Agency.

7. USGS, 1985. National Water Summary - 1984, United States Geological Survey Water - Supply Paper 2275.

8. USGS, 1986. National Water Summary - 1985, United States Geological Survey Water Supply paper 2300.

ATTACHMENT
J—3

ATTACHMENT J-3

TERRESTRIAL SYSTEMS

TERRESTRIAL SYSTEMS
DETREX CORPORATION - GOLD SHIELD SOLVENTS FACILITY
GRAND RAPIDS, MICHIGAN

The Gold Shield Solvents Facility, 312 Ellsworth Avenue S.W., is located in an industrial zone south of the downtown business district of Grand Rapids. The study area surrounding the facility, as shown on the accompanying map, is primarily industrial, with a few commercial and residential properties scattered throughout the area. The area was studied on October 17 and 18, 1988.

TERRESTRIAL SYSTEMS

FLORA:

There are no natural plant communities in the usual sense within the study area. Since the area is intensely developed, flora is determined by land use in the immediate area.

Since there is no pattern to the various land uses within the study area the area cannot be divided into sectors by Terrestrial plant communities, as is usually done in this type of study. However, the following descriptions are applicable throughout the study area.

With the exception of a few landscaped commercial facilities, virtually all of the existing flora are pioneer species, characterized by their ability to become established on very poor soil under harsh conditions. Herbacious plants identified include Golden Rod, Yellow Nut Sedge, grasses, Chicory, Dock, Milkweed, and Morning Glory. Woody plants include Cottonwood, Box Elder, Mulberry, Tree of Heaven, Hawthorn, Slippery Elm, Staghorn Sumac, Catalpa, Willow and Virginia Creeper. Virtually all plant life, with the exception of the few landscaped facilities, occurs as incidental "weedy" growth. Much of it seems to be cut and sprayed with herbicide regularly. In these areas, there are few plants over about two years old. However, in some places, especially around the few houses scattered throughout the area, the trees are much larger, up to about 24 inches in diameter, estimated to be about 30 to 40 years old.

The Gold Shield Facility itself supports no plant life at all, as the building and adjoining storage tanks cover the entire property.

Within the landscaped facilities in the study area, flora consists of well maintained lawns and introduced horticultural trees and shrubs. The trees, consisting of Colorado Spruce, Austrian Pine, Sugar Maple, Green Ash, Red Maple, and Norway Maple, range from about 4" to 10" in trunk diameter and appear to be up to about 15 years of age.

FAUNA

While no animal life was observed at the time of the study, some of the "weedier" areas could be expected to support small populations of songbirds, squirrels, and rodents.

Due to the highly developed and intensely used nature of the study area, it is highly unlikely that any rare or endangered species exist in the vicinity.

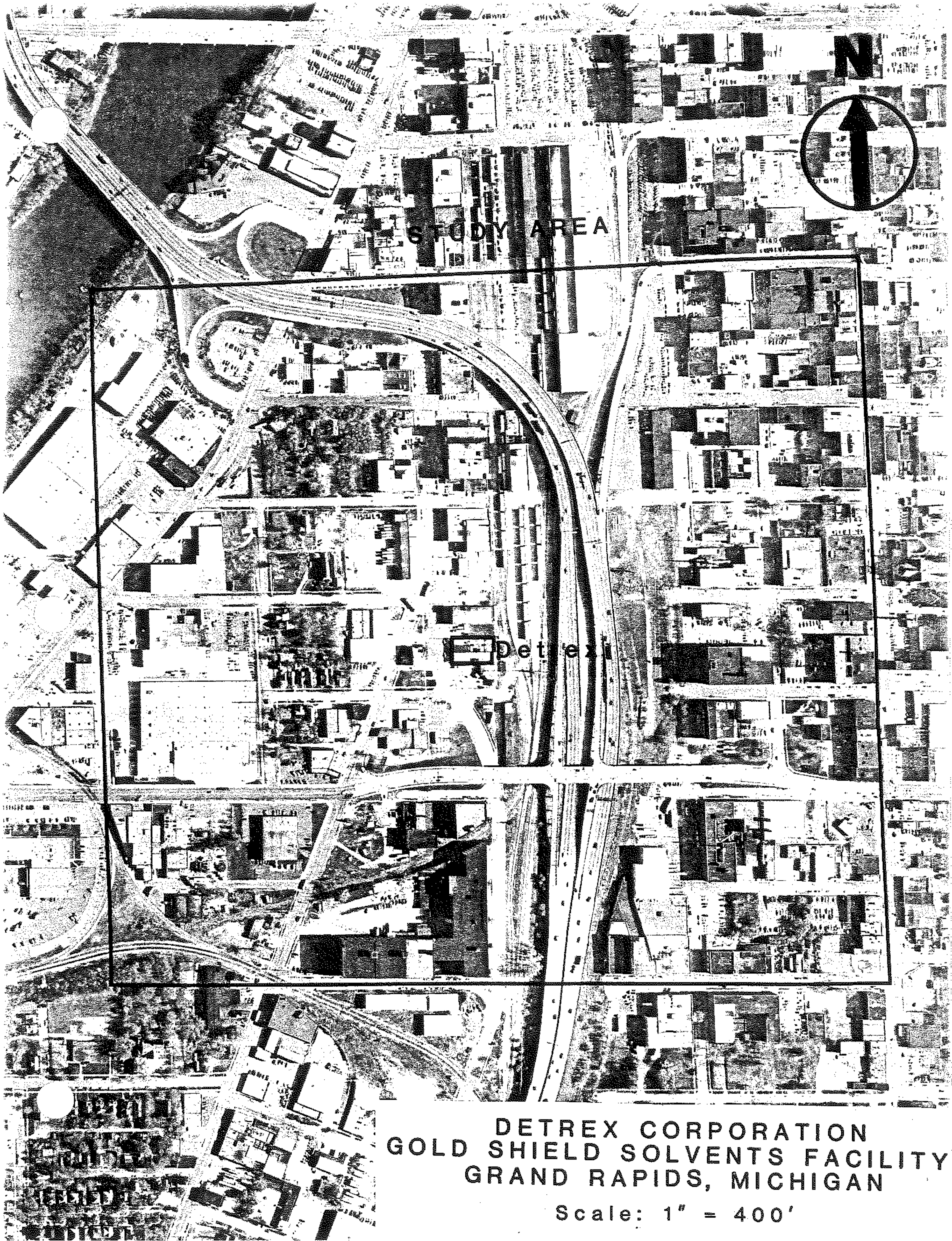
AQUATIC SYSTEMS

There are no aquatic systems of any kind within the study area. The Grand River is at the northwest corner of the study area and approximately 1800 feet from the Gold Shield Facility.

Robert Cobb, M.S.
Environmental Consultants, Inc.

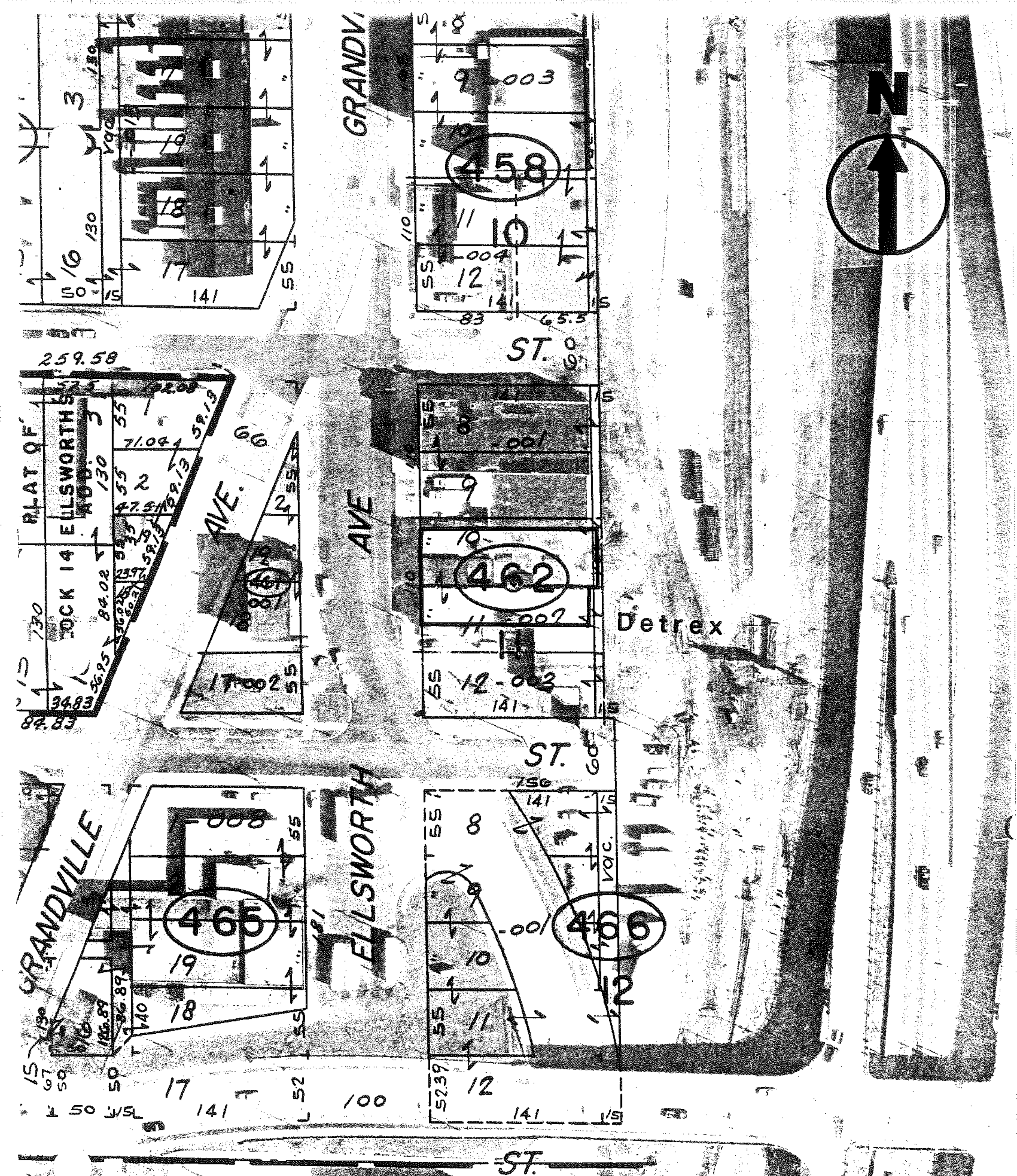
DETREX CORPORATION
GOLD SHIELD SOLVENTS FACILITY
GRAND RAPIDS, MICHIGAN

Scale 1" = 2000'



DETREX CORPORATION
GOLD SHIELD SOLVENTS FACILITY
GRAND RAPIDS, MICHIGAN

Scale: 1" = 400'



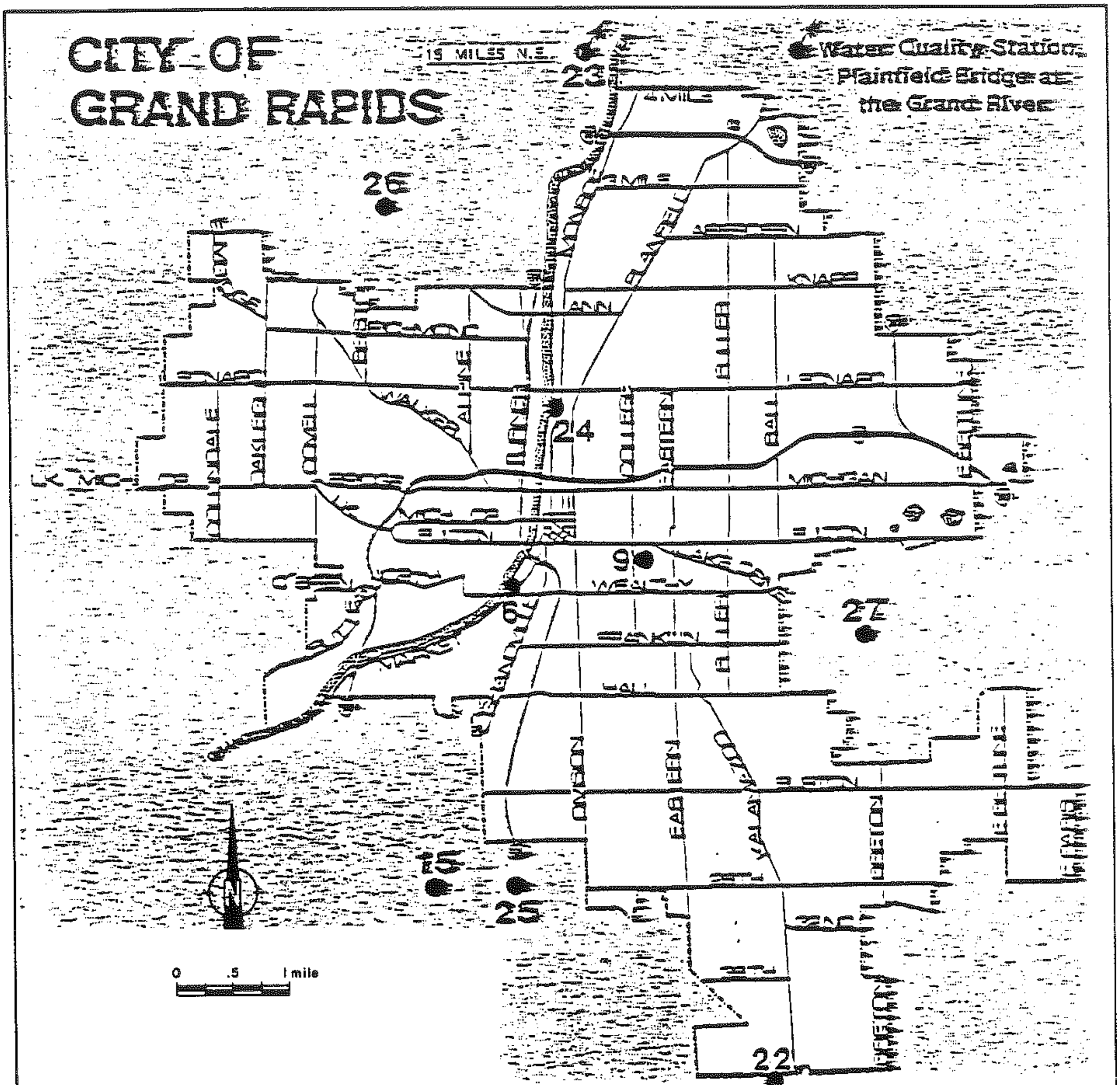
DETREX CORPORATION
GOLD SHIELD SOLVENTS FACILITY
GRAND RAPIDS, MICHIGAN

Scale: 1" = 100'

ATTACHMENT
J—4

ATTACHMENT J-4

LOCATION OF AIR MONITORING STATIONS



6 Bridgeview Building 509 Wealthy, S.W. Grand Rapids	**22** Valleywood Middle School 1110 50th, S.E. Kentwood	**25** 521 28th, S.W. (roadway lead monitor) Wyoming
9 WOTV 120 College, S.E. Grand Rapids	**23** Parnell site 15 miles N.E. of Grand Rapids	**26** 1468 3 Mile, N.W. Fire Station, Walker
15 Wyoming City Hall 1155 28th, S.W. Wyoming	**24** Grand Rapids Waterworks 1179 Monroe, N.W. Grand Rapids	**27** 2211 Lake Dr. East Grand Rapids

SOURCE : MAP F,
CITY PLANNING DEPT.,
GRAND RAPIDS, MICH.,
APRIL 1986

LOCATION OF
AIR MONITORING STATIONS
Detrex Corporation
Gold Shield Solvents, Grand Rapids

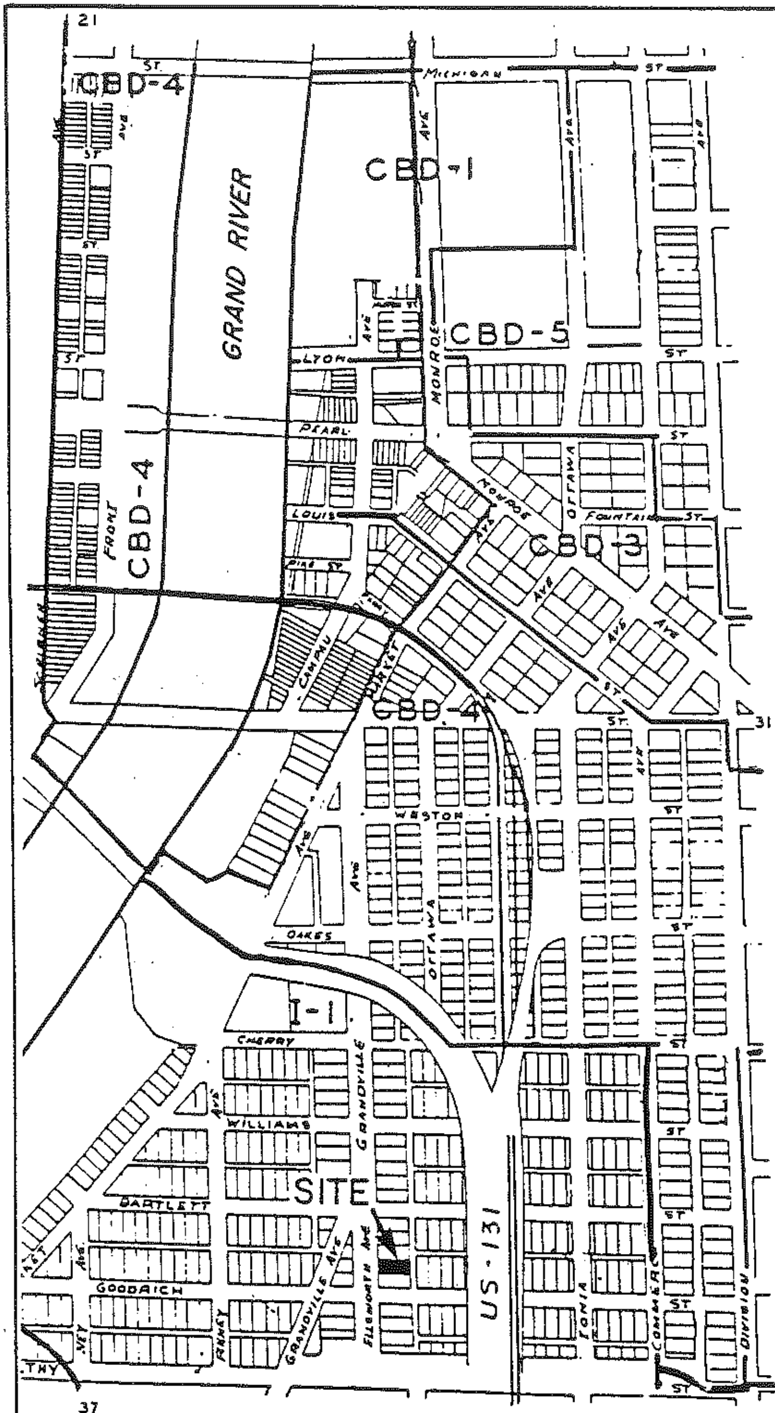
CRA

2471-4/11/88-6-D-0

ATTACHMENT
J—5

ATTACHMENT J-5

LAND USE/ZONING



LEGEND

R-1 ONE FAMILY ZONE
R-2 ONE AND TWO FAMILY ZONE
R-3 LOW DENSITY MULTIPLE FAMILY ZONE
R-4 MEDIUM DENSITY MULTIPLE FAMILY ZONE
R-5 HIGH DENSITY MULTIPLE FAMILY ZONE
SR SPECIAL RESIDENTIAL ZONE
F FLOOD ZONE
C-1 NEIGHBORHOOD COMMERCIAL ZONE
C-2 COMMUNITY COMMERCIAL ZONE
C-3 CENTRAL BUSINESS DISTRICT ZONE
- a. CBD-1 CIVIC CENTER DISTRICT
- b. CBD-2 CULTURAL CENTER DISTRICT
- c. CBD-3 CENTRAL COMMERCIAL DISTRICT
- d. CBD-4 SPECIAL ECONOMIC DEVELOPMENT DISTR
- e. CBD-5 OFFICE AND FINANCIAL DISTRICT

C-4 HEAVY COMMERCIAL ZONE
PSC PLANNED SHOPPING CENTER ZONE
I-1 LIGHT INDUSTRIAL ZONE
PID PLANNED INDUSTRIAL PARK ZONE
I-2 HEAVY INDUSTRIAL ZONE

ZONING/LAND USE MAP
Detrex Corporation
Gold Shield Solvents, Grand Rapids

CRA

2471-27/10/88-6-D-0

K

ATTACHMENT K1

SECTION K

CORRECTIVE ACTION FOR SOLID WASTE MANAGEMENT UNITS

TABLE OF CONTENTS

Page

SECTION K
CORRECTIVE ACTION FOR SOLID WASTE MANAGEMENT UNITS

TABLE OF CONTENTS

Page

SECTION K
CORRECTIVE ACTION FOR SOLID WASTE
MANAGEMENT UNITS

LIST OF TABLES

LIST OF ATTACHMENTS

SECTION K

CORRECTIVE ACTION FOR SOLID WASTE MANAGEMENT UNITS

This section of this RCRA Part B Permit Application/Act 64 Operating License Application provides a description of corrective action for the solid waste management units in operation at the Gold Shield Solvents facility in Grand Rapids, Michigan.

This information is provided pursuant to 40 CFR§264.101.

K-1 SOLID WASTE MANAGEMENT UNITS

The solid waste management units (SWMUs) presently operational at the Gold Shield Solvents facility include the following:

1) Container Storage Area
2) Waste Handling Area

SWMUs historically in operation at the facility included:

1) Waste Recycling Operation
2) Generator Accumulation Tank
3) Container Storage Areas
4) Waste Handling Area

Each of the active and inactive solid waste management units is identified on a facility plan provided in Attachment K-1a and Attachment K-1b respectively.

K-1a CHARACTERIZE THE SOLID WASTE MANAGEMENT UNITS

K-1a(1) Active Container Storage Area

The active container storage is located entirely within an enclosed building structure (see Attachment K-1a). Containers are placed in the container storage area which is underlain by a secondary containment system. The secondary containment system consists of a concrete floor slab with peripheral concrete block walls. The floor slab is free of all gaps, floor drains or other such openings. Further details on the container storage area are presented in Section D of this permit application.

The container storage area has been in operation since the facility started operations in 1970. The maximum volume of hazardous waste that may be stored in the container storage area is 21,900 gallons (398 x 55 gallon drums). A list of each of the hazardous wastes and the appropriate Hazardous Waste Identification Numbers and hazardous constituent/characteristic of the waste is presented in Table K-1.

K-1a(2) Active Waste Handling Area

The active loading/unloading area, indicated on the facility plan in Attachment K-1a, is utilized for the loading/unloading of hazardous waste drums while shipping to and from the facility.

TABLE K-1

LIST OF HAZARDOUS WASTES

	EPA Hazardous Waste Number	Hazardous Constituent/ Characteristic
1,1,1 Trichloroethane	F001	Toxic
Trichloroethylene	F001	Toxic
Perchloroethylene	F001	Toxic
Methylene Chloride	F001	Toxic
Trichlorotrifluoroethane	F001	Toxic
1,1,1 Trichloroethane	F002	Toxic
Trichloroethylene	F002	Toxic
Perchloroethylene	F002	Toxic
Methylene Chloride	F002	Toxic
Trichlorotrifluoroethane	F002	Toxic

Waste drum handling practises include the loading/unloading of drums to/from a truck, using a forklift equipped with a drum handling attachment, and the transfer of these drums to the appropriate area in the container storage area.

The loading/unloading ramp is constructed of concrete. A sump is located in the base of the ramp. The sump is connected to the storm sewer, however, during loading/unloading operations, the pipe connecting the sump to the storm sewer is plugged to prevent spilled material, if any, from entering the sewer.

K-1a(3) Inactive Waste Recycling Operation

Gold Shield Solvents historically recovered solvents from hazardous waste streams via distillation at the Grand Rapids facility. Hazardous wastes were received at the facility in 55 gallon drums. Upon receipt, all drums were dated, sampled and transferred to the appropriate area in the hazardous waste container storage areas to await recycling.

Once the drum contents had been identified by specific gravity and/or chromatographic analysis, drums containing the same solvent (i.e. TCE) were transferred to the recycling area. The drum contents were charged individually into a batch distillation unit and the solvent content removed by heating the material with indirect stream. As the still level fell, additional waste was introduced until the still reboiler contained essentially only still bottoms. At this point, the still bottoms were heated to a pre-determined temperature to reduce the solvent content further. After this final heating the still bottoms were transferred to an accumulation tank to await final disposal. The cycle was repeated over and over again until all of the similar waste (i.e. TCE) had been processed. The location of the distillation area is located on Attachment K-1b.

K-1a(4) Inactive Generator Accumulation Tank

The Gold Shield Solvents hazardous waste recycling operation historically used seven generator accumulation tanks totalling 4,365 gallons (see location on Attachment K-1b) for the accumulation of still bottoms remaining at the end of the distillation procedures. Hazardous wastes were stored in these tanks for less than 90 days, prior to off-site disposal/treatment. The tanks were utilized from 1970 to 1987, at which time the inventory was removed, and the tanks cleaned. The tanks were constructed of carbon steel, however, specifications are not available. The tanks were used to store any of the F002 wastes listed on Table K-1. The dimensions and capacity of each tank are summarized as follows:

Tank No.	Capacity (gal.)	Dimensions (LxWxH)
1	300	48 1/4" x 32 1/4" x 48 1/4"
2	500	72 1/4" x 36 1/4" x 48 1/4"
3	500	72 1/4" x 36 1/2" x 48"
4	350	48 1/4" dia. x 42 1/2" long
5	905	80 1/2" x 39" x 70"
6	905	80 1/2" x 39" x 70"
7	905	80 1/2" x 39" x 70"
Total	4,365	

K-1a(5) Inactive Container Storage Areas

Hazardous wastes were historically stored in containers in areas other than discussed in Section K-1a(1). As with the existing container storage area, the inactive areas were located entirely within the enclosed building structure with similar secondary containment. The inactive container storage areas are located on Attachment K-1b. These areas were in operation from 1970 to 1987, at which time their inventory was transferred to the active container storage area or shipped off-site for recycling a list of the hazardous wastes which may have been stored in these areas is presented in Table K-1.

K-1a(6) Inactive Waste Handling Area

Still bottoms were historically transferred from the generator accumulation tank via above ground piping to tankers at the back of the facility. The loading area is shown on Attachment K-1b. There was no secondary containment provided in this area. Loading in this area was conducted from 1970 to 1986. Wastes which were loaded in this area consisted of the F002 wastes listed on Table K-1.

K-2 RELEASES

K-2a Characterize Releases

There have been no known releases from any of the solid waste management units in operation at the Gold Shield Solvents facility in Grand Rapids, Michigan, with the exception of a release near the inactive waste handling area at the back of the building. In 1985, the MDNR discovered drippings from a pipe located at the back of the building. An initial investigation was conducted by Gold Shield Solvents which identified the presence of solvents in the soils.

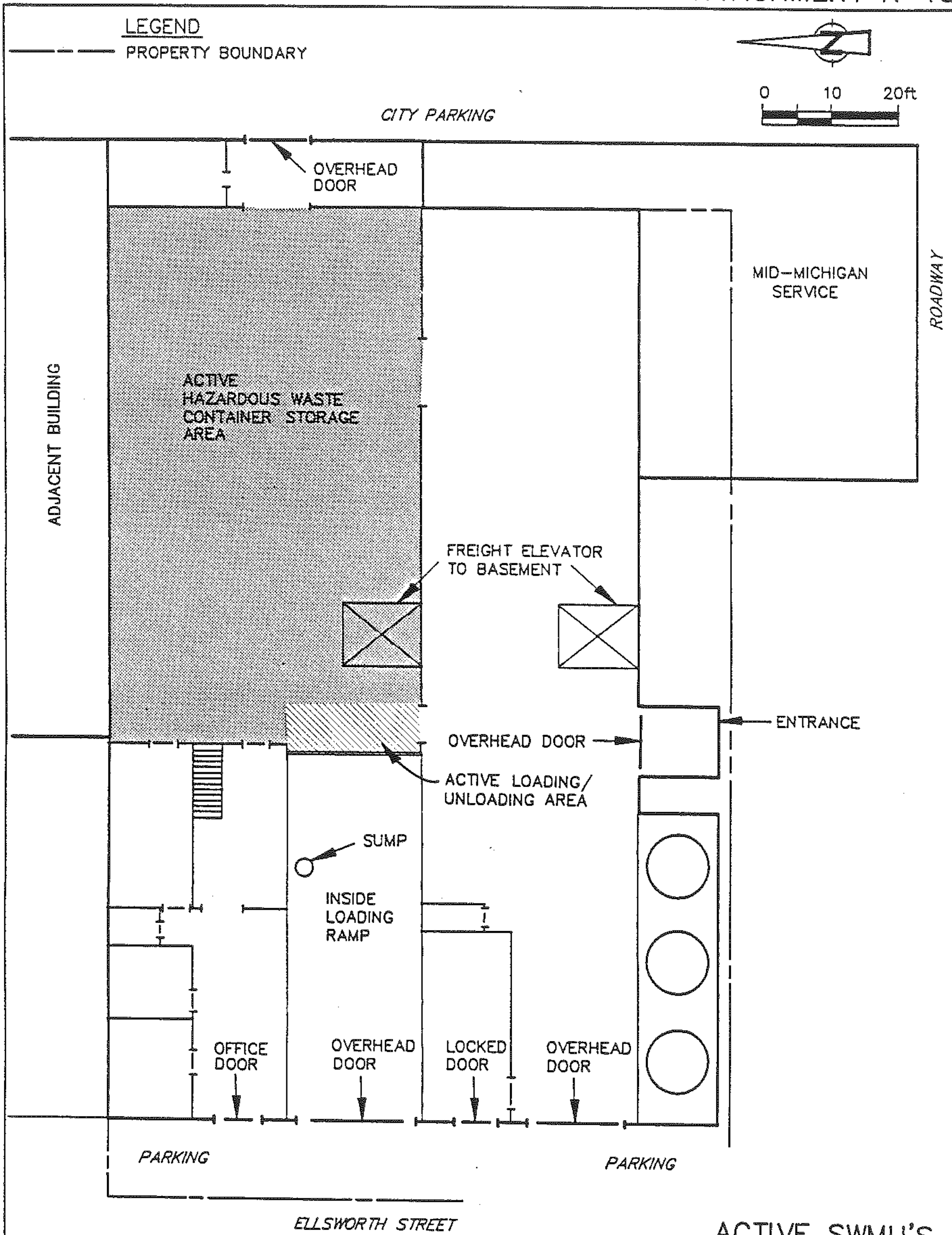
Gold Shield Solvents subsequently prepared, submitted and received approval from the MDNR on a Work Plan to determine the horizontal and vertical extent of soil contamination. A copy of the work plan is enclosed as Attachment K-2. Results of the investigation are presented in the report enclosed as Attachment K-3. Based on the results of the investigation, Gold Shield Solvents excavated and disposed off-site approximately 300 cubic yards of soil in 1986, as agreed to with the MDNR.

ATTACHMENT K-1

LOCATION OF SOLID WASTE

MANAGEMENT UNITS

ATTACHMENT K-1a

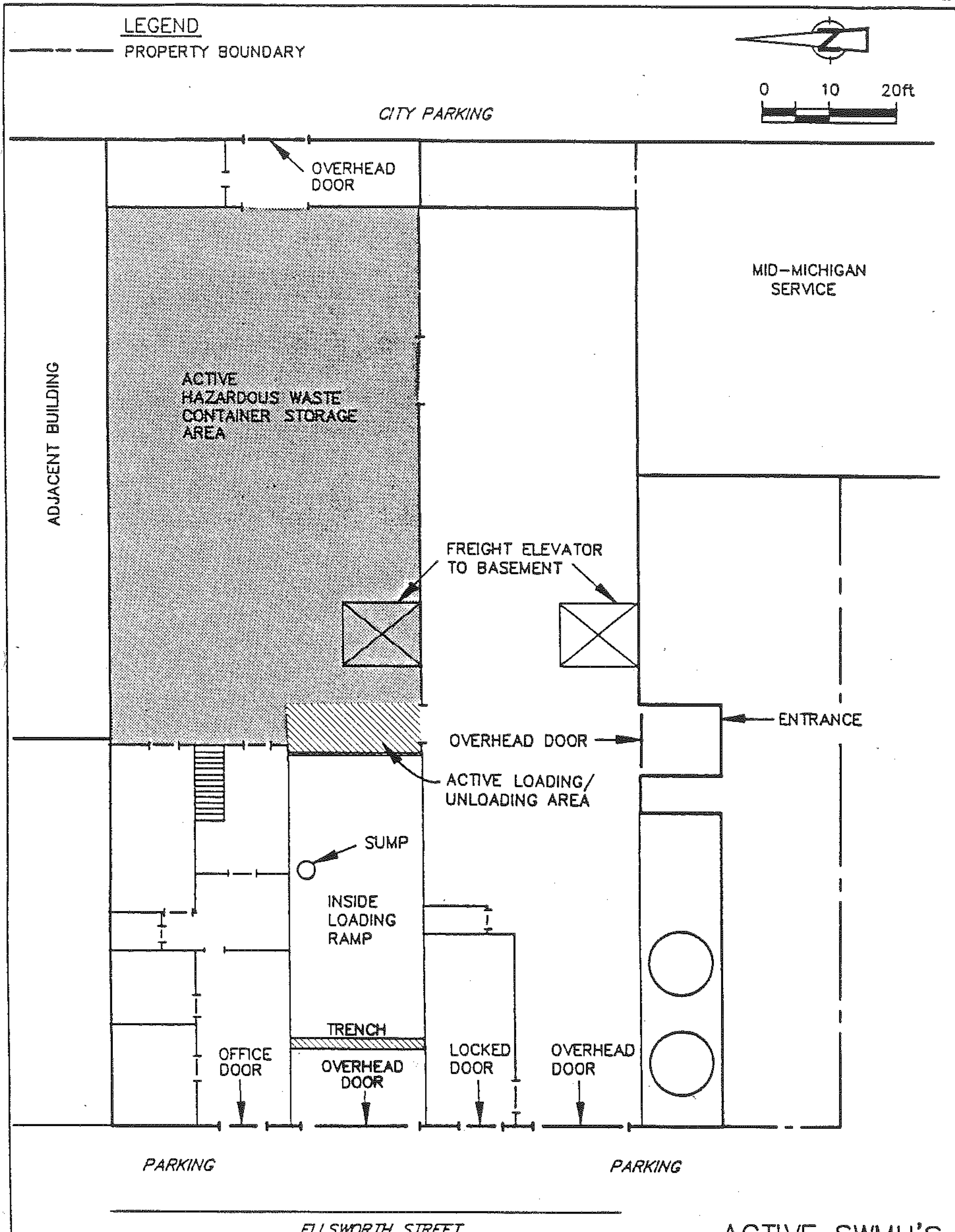


ACTIVE SWMU'S
Detrex Corporation
Gold Shield Solvents, Grand Rapids

CRA

2471-4/11/88-6-D-0

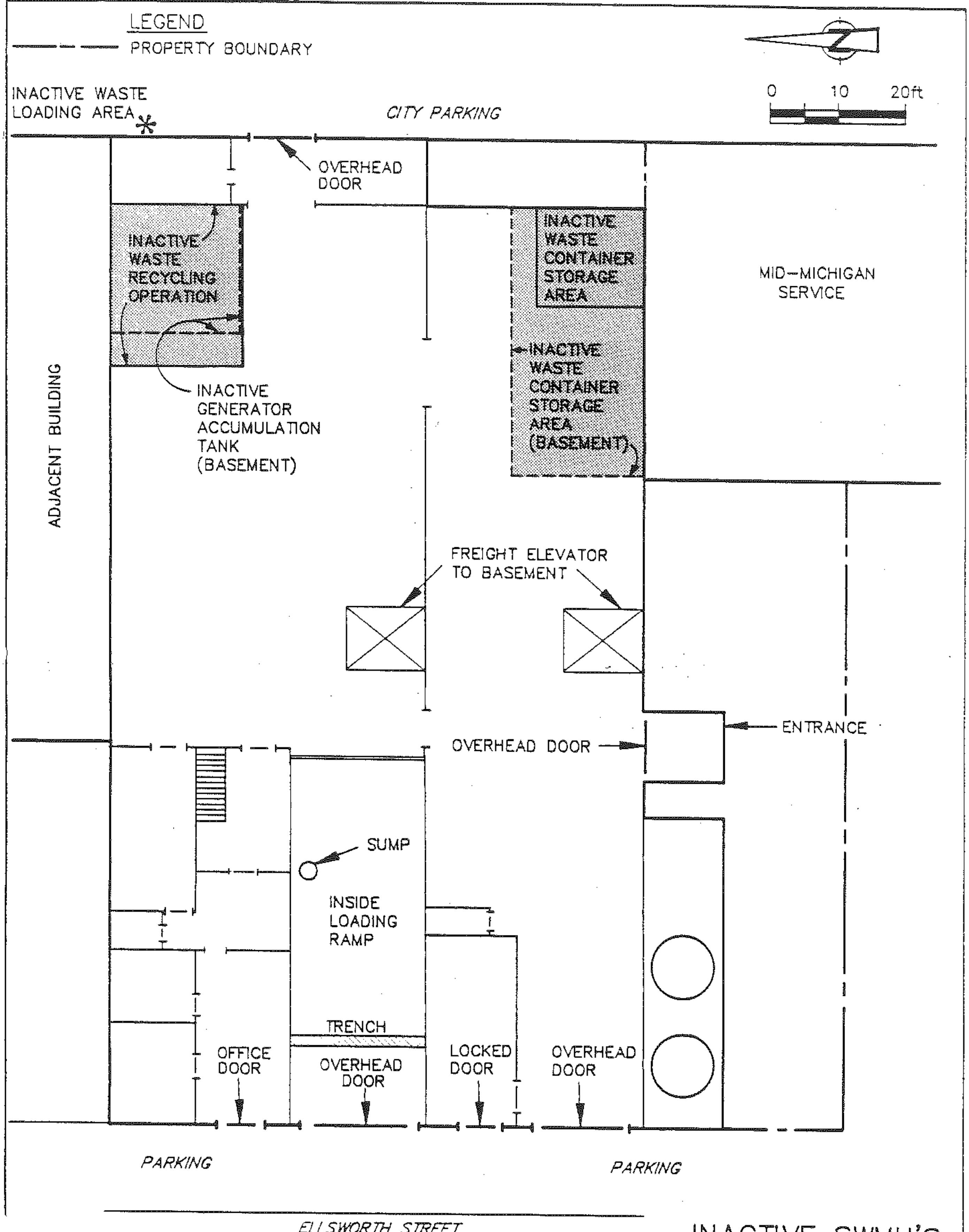
ATTACHMENT K-1a



ACTIVE SWMU'S
Detrex Corporation
Gold Shield Solvents, Grand Rapids

CRA

2471-4/11/88-6-D-1



INACTIVE SWMU'S

Detrex Corporation

Gold Shield Solvents, Grand Rapids

CRA

2471-4/11/88-6-D-1

ATTACHMENT K2

ATTACHMENT K-2

WORK PLAN FOR A

SOILS CONTAMINATION INVESTIGATION

WORK PLAN

FOR A

SOILS CONTAMINATION INVESTIGATION

FOR

G O L D   S H I E L D   S O L V E N T S

GRAND RAPIDS, MICHIGAN

DECEMBER 1985

JAN 17 1986

TABLE OF CONTENTS

LIST OF APPENDICES

SITE DESCRIPTION

Gold Shield Solvents is a division of Detrex Chemical Industries, Inc. of Southfield, Michigan. One of the Gold Shield branches is located at 312 Ellsworth Street in the southwest section of the City of Grand Rapids, Michigan. Figure 1 presents a general geographical location map of the Grand Rapids plant and the neighborhood. As can be seen in this figure, the plant is located in an industrial/commercial area. The site is located immediately west of the expressway US-131.

The entire plant is confined to one building facing due west. Figure 2 depicts the details of the plant site.

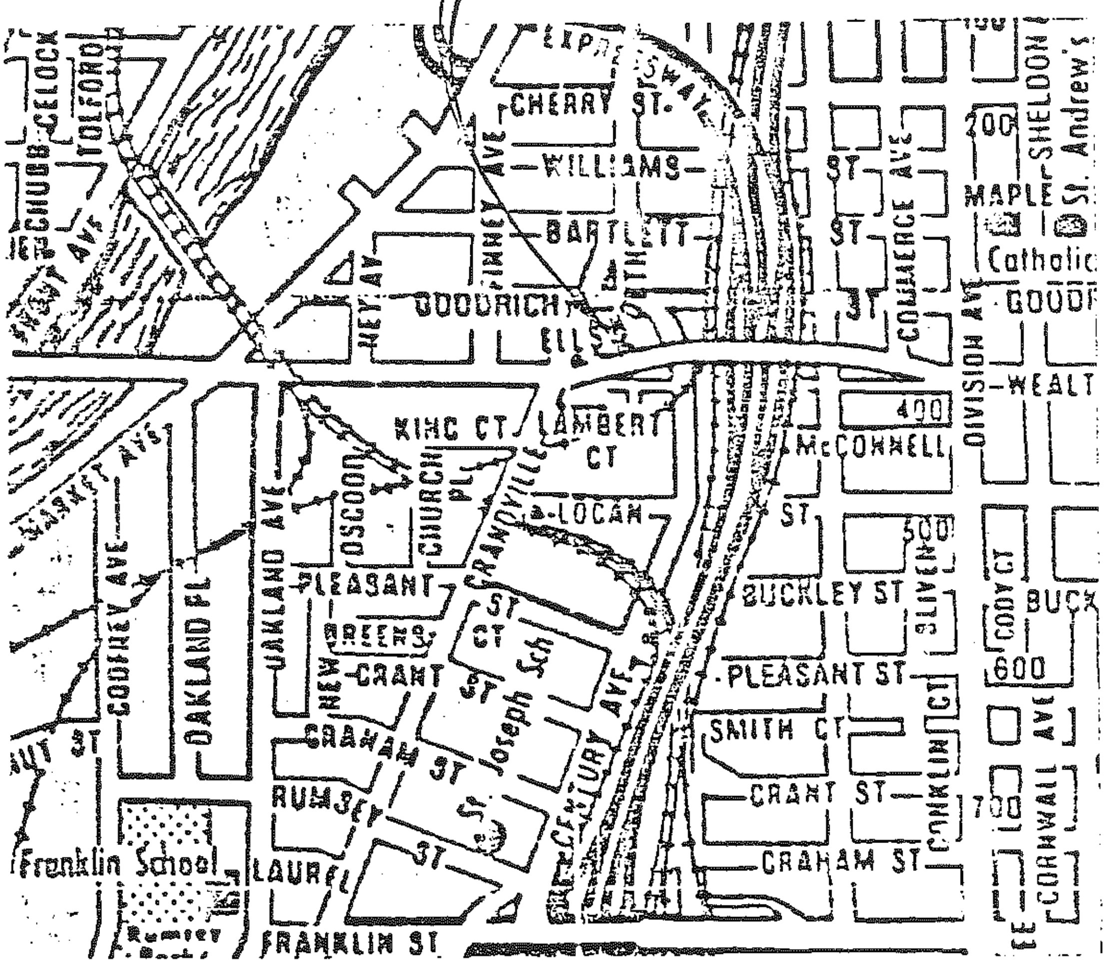
C&O railway tracks lie at the eastern boundary of the plant building along with other trackage to the east of the spur. This area is now controlled by the City of Grand Rapids.

There is a sanitary sewer (or storm sewer) just beyond the tracks. No other utilities, are obvious at the location, but this needs to be checked carefully.

NATURE AND EXTENT OF THE PROBLEM

Personnel of the Michigan Department of Natural Resources (MDNR) discovered, during a routine visit, drippings from a pipe located at the back of the plant building. Oil stains were detected at the soil surface between the building and the rail spur. At the request of MDNR, Gold Shield dug a trench a few feet wide and about 34 feet long along the back of the plant building. The trench is covered with 4' x 8' plywood sheets and plastic, but is accessible upon removal of this cover. The trench was approximately 3 feet deep initially. A soil sample from the bottom of the initial trench was taken. This sample was taken at the east wall of the trench opposite to the south edge of the door. The analysis indicated the presence of 4.8 ppm of tetrachloroethene (PCE), 5.5 ppm of 1,1,1-trichloroethane (TCA), and 2,500 ppm of trichloroethene (TCE). A post hole dug about 10 feet east of the east trench wall and at a depth of about 3 feet produced soil samples with a concentration of 710 ppm of TCE.

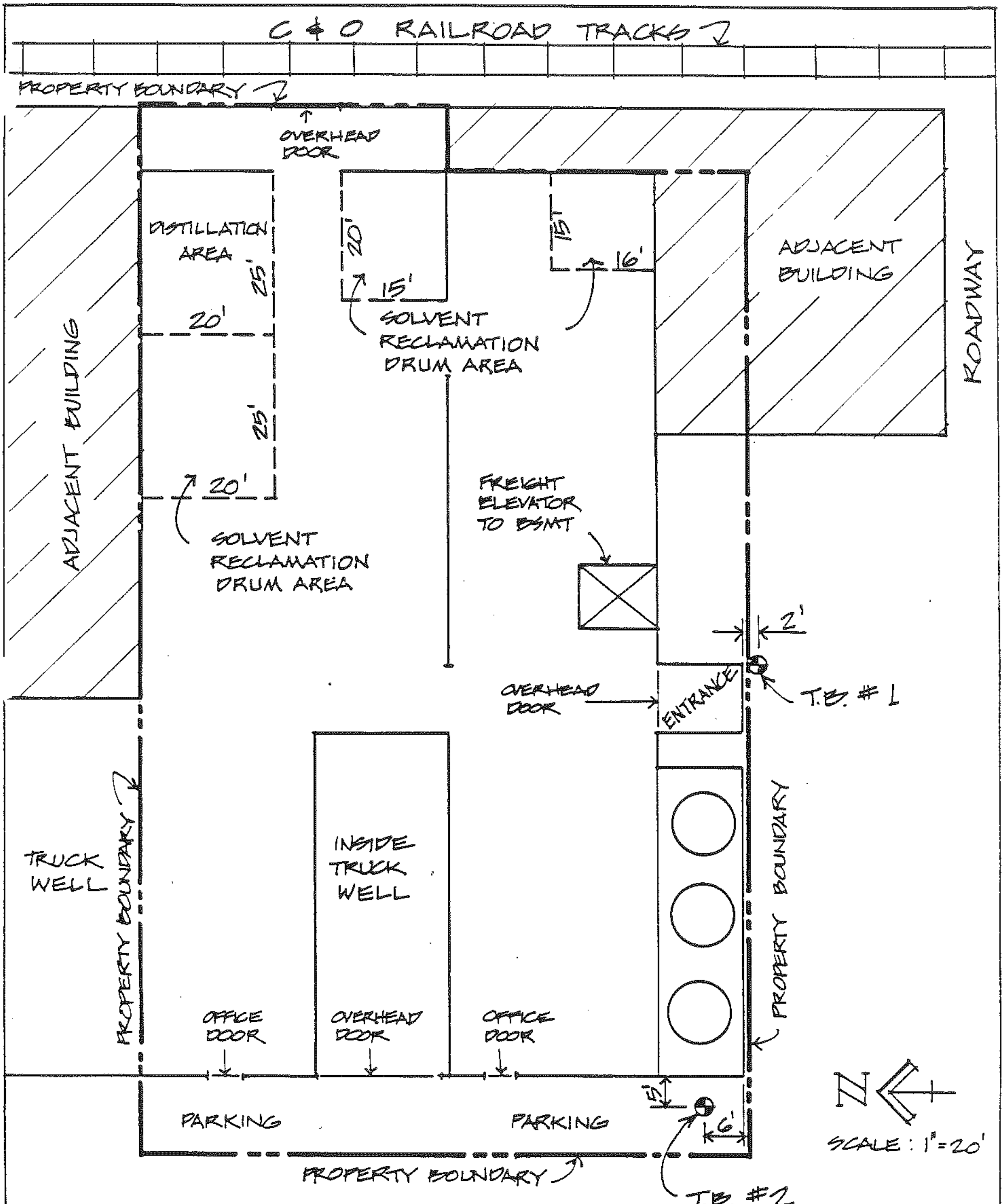
GOLD SHIELD SOLVENTS
PLANT SITE
(312 ELLSWORTH ST., S.W.)



LOCATION MAP
OF THE
PLANT SITE

GOLD SHIELD SOLVENTS
312 ELLSWORTH ST. S.W.
GRAND RAPIDS, MICHIGAN

Figure 1



DETAILS OF THE PLANT SITE

GOLD SHIELD SOLVENTS
312 ELLSWORTH ST. SW.
GRAND RAPIDS, MICHIGAN

Figure 2

20510 EDI ENGINEERING & SCIENCE

After the trench was further dug to the present depth of about 5 feet, two other samples were taken at the bottom of the northeastern and southeastern corners of the trench. The sample analyses indicated concentrations of 0.7 ppm and 29 ppm of TCE in these respective locations. The laboratory analytical results are presented in Appendix A.

Excavated soils have been drummed and are stored in the warehouse.

MDNR asked Gold Shield to determine the extent of soil contamination by TCE and other organics common to the plant operation. The objective of this work plan is therefore to identify the horizontal and vertical extent of contamination of the soil; and also to determine if there is potential for the contaminants to have reached groundwater.

HYDROGEOLOGY

The hydrogeological description given below is an approximate interpretation based on limited available data. The sources of data include: (a) two soil borings drilled in July, 1984; (b) visual observations of the recent trenching; (c) USGS mapping, and (d) recent work in the area by EDI for another client.

The soil borings were performed by Professional Service Industries, Inc. for Gold Shield Solvents. Soil tests were conducted for a new tank foundation and dike on the southwest side of the plant building. Boring locations are shown on Figure 2 and soil boring logs and other pertinent information are given in Appendix B.

The 25-foot borings indicate 5 to 8 feet of fill over 4 to 8 feet of silty clay. The clay layer is underlain by 3 to 5 feet of fine sands, probably interspersed with silt or clay lenses. Beneath this fine sand, coarse to fine sand and gravels, with silts, exist to the 25-foot level. Groundwater was not noted in either boring - moisture was noted at the 22-foot level in the southernmost boring. Fill materials probably exist around the basement area of the buildings in this area.

The Grand River runs north and south to the west of the area with an average river stage at approximately USGS elevation 590. The affected plant area lies at approximately USGS elevation 605. A substantial ridge runs north and south between Gold Shield and the river west of Grandville Avenue.

Regional groundwater levels are known to rise from elevation 590 to 595 near the river, to elevations of 600 to 605 along the ridge. Regional groundwater levels east of the ridge, in the area sloping down towards Gold Shield and the expressway, are unknown, and may be impacted by drainage facilities to the east and north of the site. Local groundwater levels may be as much as 25 feet below surface.

Local and regional groundwaters are not used for potable supplies, and the groundwater is known to be contaminated from a number of potential sources in the area.

PHASE ONE

TECHNICAL APPROACH

Initial work efforts will focus on:

1. determining the local, vertical geologic profile.
2. soil borings and soils analyses in a logical grid pattern in the impacted area to determine lateral and vertical extent of soils contamination.

Extraordinary efforts will be undertaken during borings to ensure that any surficial contamination cannot migrate downward through the clay layer.

CONTROL BORING

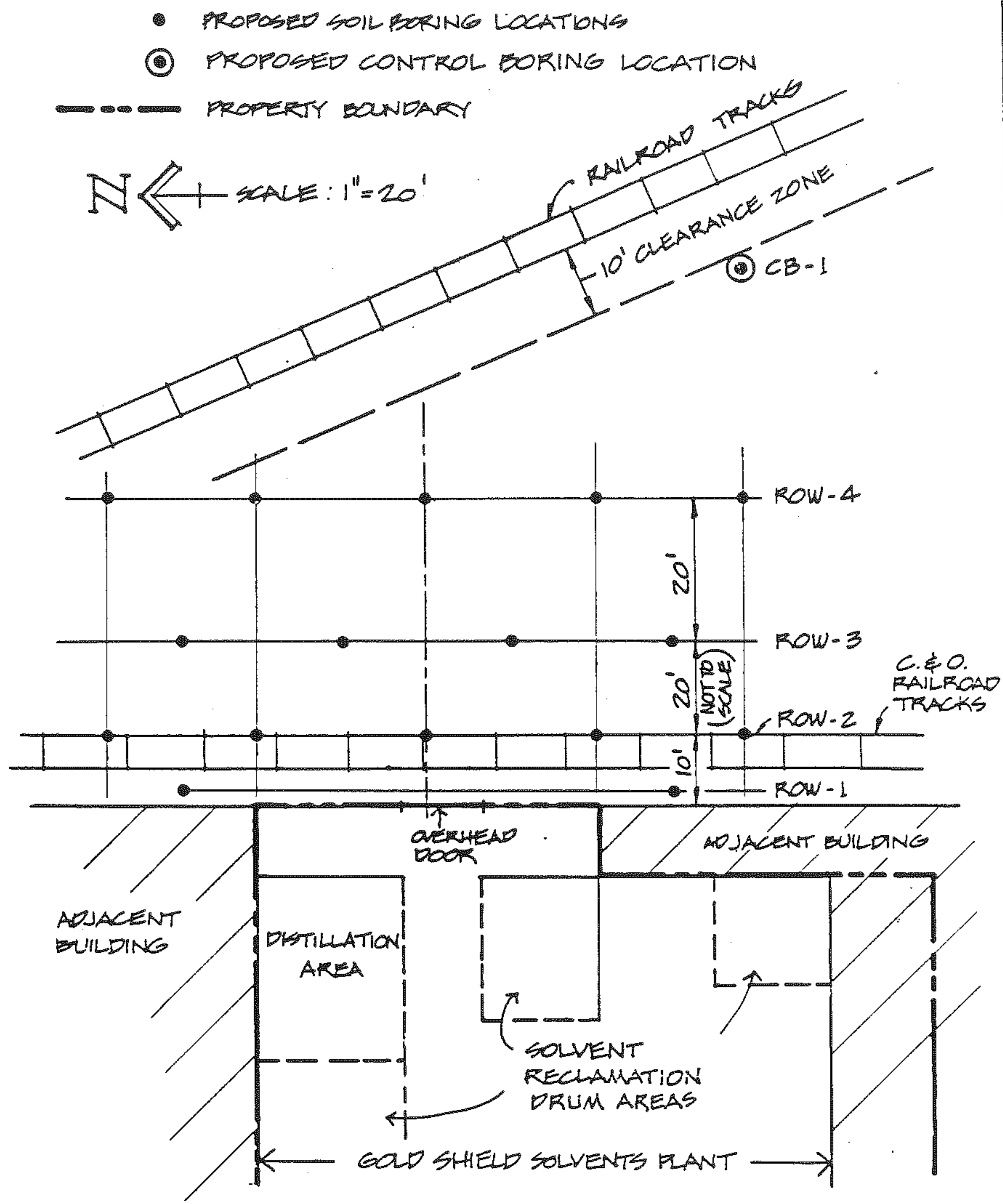
We propose to install a control boring as shown as CB1 in Figure 3. The purposes are:

- o to obtain a dependable vertical soil profile
- o to determine the permeability of undisturbed soil in the general area

The control boring will be constructed with hollow stem auger drill with continuous split spoon sampling for the entire depth. All soil samples will be labeled according to their depth of sampling and will be stored @ $4^{o}C$ until they are ready to be tested. The boring will be continuously plugged with bentonite-concrete slurry. As shown in Figure 3, the location of the control boring is anticipated to be outside of the zone in question adjacent to the Gold Shield Facility. Sampling will continue to within approximately three feet above the water table.

SOIL BORINGS

It is proposed to construct soil borings at 16 locations in a grid system as shown in Figure 3. The grid system consists of four rows. The rows are laid along the north-south direction and are identified by Row 1 through Row 4 as shown in Figure 3. Row 1 consists of two boring locations placed immediately east of the plant building approximately 60 feet apart from each other.



GRID SYSTEM FOR PROPOSED SOIL BORINGS

GOLD SHIELD SOLVENTS
312 ELLSWORTH ST. S.W.
GRAND RAPIDS, MICHIGAN

Figure 3

20510

EDI ENGINEERING & SCIENCE

Row 2 is located 10 feet east of the building with grid intervals for the rest of the boring locations in the east-west and north-south directions are as shown in Figure 3.

Split spoon samples from each boring location will be collected in a manner similar to that used for the control boring. The split spoon sampler will be decontaminated between samples and the auger will be steam-cleaned between holes. Approximate boring depths will be estimated from the soil profile obtained from the control boring. These may change, however, depending on the actual field conditions. All borings will be backfilled immediately with bentonite-concrete slurry.

In order to analyze soil borings, samples will be taken at discrete depths as indicated.

Sample Schedule for Soil Borings

Sample No.	Depth (ft)
1	1
2	3
3	6
4	9
5	12
6	15

The deepest sample will first be analyzed for TCE, 1,1,1-TCA and PCE. If analysis so indicates, the next shallower sample will be analyzed. If both samples show significant concentrations of these compounds, no further analysis will be conducted at that boring location. If no significant concentrations are obtained, shallower samples will be analyzed.

Three representative, undisturbed soil samples of consolidated material will be taken from the control boring and permeability tests will be run on these three samples.

SAMPLE ANALYSIS

Soil samples will be collected in appropriate VOC vials and will be stored at 4^{o}C immediately after collection. Appropriate soil samples collected from these 16 borings will be analyzed for PCE, TCE and 1,1,1-TCA by EDI. Normal laboratory turnaround time is three weeks, including QA/QC analysis and reporting. The soil sample preparation and analysis will be performed according to the Procedures described in Methods 5030 and 8010, respectively, of the document "U.S. EPA Test Methods for Evaluating Solid Waste. Physical/ Chemical Methods, SW-846, July 1982".

Representative soil samples will also be classified by the Unified System Classification of Soils (ASTM designation D-2487).

TIME FRAME

We will begin within two weeks of notice-to-proceed and the approval of adjacent landowner. The control boring will be completed in one or two working days. Initial testing services on control boring samples will be reported in three weeks. Soil borings will take one week. Analytical results and final report will be submitted five weeks thereafter. Thus, the total project time will be approximately ten weeks from startup.

APPENDIX A

LABORATORY ANALYTICAL RESULTS

ANALYSIS REQUEST SHEET

SAFETY WARNING

LAB LOG# 7349 PROJ CODE ________ COST CENTER 3411 90175 PR II RECEIVED AT LAB RQJ DATE TIME 11/4/85 1445 AM PM

LOCATION SAMPLED: GOLD SHIELD SOLVENTS COLLECTED BY: A. PRZYBYLA TRANSFERED TO: [illegible]

SAMPLE REMARKS: AMT. OF ORGANIC FREE WATER ADDED IS ON BOTTLE LABEL SEND RESULTS TO (NAME & SECTION): A. PRZYBYLA, GQD, GRAND RAPIDS

LAB USE ONLY	#	FIELD ID OR DESCRIPTION	SAMPLE INFORMATION	YY/MM/DD	HH:MM
54256	01	IN HOLE		11/1/85	
54257	02	POST HOLE	NOV 1 1985		
	03		DISTRICT 9		
	04		GRAND RAPIDS		
	05				
	06				
	07				
	08				
	09				
	10				

ORGANIC CONTAMINANTS

POS1* #1 HALOCARBONS.................... $\boxed{1\ 2}$ 3 4 5 6 7 8 9 10

POS2* #2 AROMATIC HYDROCARBONS.......... 1 2 3 4 5 6 7 8 9 10

OS #3 CL HC & PESTICIDES & PCB....... 1 2 3 4 5 6 7 8 9 10
#6 PHTHALATES..................... 1 2 3 4 5 6 7 8 9 10
#7 PNA............................ 1 2 3 4 5 6 7 8 9 10
.... 1 2 3 4 5 6 7 8 9 10
.... 1 2 3 4 5 6 7 8 9 10
.... 1 2 3 4 5 6 7 8 9 10

OS OIL & GREASE - IR................. 1 2 3 4 5 6 7 8 9 10
OIL & GREASE - GRAVIMETRIC........ 1 2 3 4 5 6 7 8 9 10

.... 1 2 3 4 5 6 7 8 9 10
.... 1 2 3 4 5 6 7 8 9 10
.... 1 2 3 4 5 6 7 8 9 10

GENERAL CHEMISTRY

MS COD............................. 1 2 3 4 5 6 7 8 9 10
KJELDAHL NITROGEN, TOTAL PHOS..... 1 2 3 4 5 6 7 8 9 10
PHENOLICS......................... 1 2 3 4 5 6 7 8 9 10
TOTAL CYANIDE..................... 1 2 3 4 5 6 7 8 9 10
TOTAL SOLIDS...................... 1 2 3 4 5 6 7 8 9 10
.... 1 2 3 4 5 6 7 8 9 10

INORGANIC CONTAMINANTS

MS CA MG NA K....................... 1 2 3 4 5 6 7 8 9 10
.... 1 2 3 4 5 6 7 8 9 10
CD CR CU NI PB ZN................. 1 2 3 4 5 6 7 8 9 10
.... 1 2 3 4 5 6 7 8 9 10
AS ARSENIC........................ 1 2 3 4 5 6 7 8 9 10
HG MERCURY........................ 1 2 3 4 5 6 7 8 9 10
SB ANTIMONY....................... 1 2 3 4 5 6 7 8 9 10
.... 1 2 3 4 5 6 7 8 9 10
AL ALUMINUM....................... 1 2 3 4 5 6 7 8 9 10
CO COBALT......................... 1 2 3 4 5 6 7 8 9 10
FE IRON........................... 1 2 3 4 5 6 7 8 9 10
LI LITHIUM........................ 1 2 3 4 5 6 7 8 9 10
MN MANGANESE...................... 1 2 3 4 5 6 7 8 9 10
MO MOLYBDENUM...................... 1 2 3 4 5 6 7 8 9 10
TI TITANIUM....................... 1 2 3 4 5 6 7 8 9 10
V VANADIUM........................ 1 2 3 4 5 6 7 8 9 10
.... 1 2 3 4 5 6 7 8 9 10
.... 1 2 3 4 5 6 7 8 9 10
.... 1 2 3 4 5 6 7 8 9 10

.... 1 2 3 4 5 6 7 8 9 10
.... 1 2 3 4 5 6 7 8 9 10
.... 1 2 3 4 5 6 7 8 9 10
.... 1 2 3 4 5 6 7 8 9 10

MICH DNR ENVIRONMENTAL LAB
ORGANIC RESULTS FOR LAB LOG #7349

LAB# 54256 REC# 3878	ug/Kg ppb	SCAN 1	COMMENTS
	5500.00	1*1*1-TRICHLOROETHANE	UC ALL DR
	2500000.00	TRICHLOROETHENE	* * * *
	4800.00	TETRACHLOROETHENE	UC
	1100.00	Detection limit	

LAB# 54257 REC# 3879	ug/Kg ppb	SCAN 1	COMMENTS
	710000.00	TRICHLOROETHENE	DR
	9900.00	Detection limit	

Unless noted above under COMMENTS, analyses were performed for the compounds on attached scan list. Concentrations are rounded to 2 significant figures.

Approved ____________________
NOV 13 1985

RECEIVED
GROUNDWATER QUALITY DIV
NOV - 1985
DISTRICT 9
GRAND RAPIDS

ELUOU

SL068

1/70A

MICHIGAN DEPT OF NATURAL RESOURCES ENVIRONMENTAL LABORATORY
ANALYSIS REQUEST SHEET

INFO ON BACK

MATRIX = SEDIMENT/SOIL

SAFETY WARNING

LAB LOG#	7447
PROJ CODE	
COST CENTER	3411 / 45303
PR	II
RECEIVED AT LAB	[illegible]
DATE TIME	11/20/85 1355
LOCATION SAMPLED	GOLD SHIELD SOLVENTS
COLLECTED BY	A. [illegible]
TRANSFERED TO	[illegible]
SAMPLE REMARKS	[illegible]
SEND RESULTS TO (NAME & SECTION)	[illegible]

LAB USE ONLY	#	FIELD ID OR DESCRIPTION	SAMPLE INFORMATION	YY/MM/DD	HH:MM
54697	01	N. BOTTOM HOLE		85/11/19	[illegible]
54698	02	S. BOTTOM HOLE		↓	[illegible]
	03				
	04				
	05				
	06				
	07				
	08				
	09				
	10				

WASTE MANAGEMENT C. DIV. GROUNDWATER QUALITY
DEC 3 1985
DISTRICT 9 GRAND RAPIDS

ORGANIC CONTAMINANTS

P001 01 HALOCARBONS	$\boxed{1\ 2}$ 3 4 5 6 7 8 9 10
P002 02 AROMATIC HYDROCARBONS	1 2 3 4 5 6 7 8 9 10
03 CL HC & PESTICIDES & PCB	1 2 3 4 5 6 7 8 9 10
06 PHTHALATES	1 2 3 4 5 6 7 8 9 10
07 PNA	1 2 3 4 5 6 7 8 9 10
....	1 2 3 4 5 6 7 8 9 10
....	1 2 3 4 5 6 7 8 9 10
....	1 2 3 4 5 6 7 8 9 10
OIL & GREASE - IR	1 2 3 4 5 6 7 8 9 10
OIL & GREASE - GRAVIMETRIC	1 2 3 4 5 6 7 8 9 10
....	1 2 3 4 5 6 7 8 9 10
....	1 2 3 4 5 6 7 8 9 10
....	1 2 3 4 5 6 7 8 9 10

GENERAL CHEMISTRY

COD	1 2 3 4 5 6 7 8 9 10
KJELDAHL NITROGEN, TOTAL PHOS.	1 2 3 4 5 6 7 8 9 10
PHENOLICS	1 2 3 4 5 6 7 8 9 10
TOTAL CYANIDE	1 2 3 4 5 6 7 8 9 10
TOTAL SOLIDS	1 2 3 4 5 6 7 8 9 10
....	1 2 3 4 5 6 7 8 9 10

INORGANIC CONTAMINANTS

CA MG NA K	1 2 3 4 5 6 7 8 9 10
....	1 2 3 4 5 6 7 8 9 10
CD CR CU NI PB ZN	1 2 3 4 5 6 7 8 9 10
....	1 2 3 4 5 6 7 8 9 10
AS ARSENIC	1 2 3 4 5 6 7 8 9 10
HG MERCURY	1 2 3 4 5 6 7 8 9 10
SB ANTIMONY	1 2 3 4 5 6 7 8 9 10
....	1 2 3 4 5 6 7 8 9 10
AL ALUMINUM	1 2 3 4 5 6 7 8 9 10
CO COBALT	1 2 3 4 5 6 7 8 9 10
FE IRON	1 2 3 4 5 6 7 8 9 10
LI LITHIUM	1 2 3 4 5 6 7 8 9 10
MN MANGANESE	1 2 3 4 5 6 7 8 9 10
MO MOLYBDENUM	1 2 3 4 5 6 7 8 9 10
TI TITANIUM	1 2 3 4 5 6 7 8 9 10
V VANADIUM	1 2 3 4 5 6 7 8 9 10
....	1 2 3 4 5 6 7 8 9 10
....	1 2 3 4 5 6 7 8 9 10
....	1 2 3 4 5 6 7 8 9 10

....	1 2 3 4 5 6 7 8 9 10
....	1 2 3 4 5 6 7 8 9 10
....	1 2 3 4 5 6 7 8 9 10
....	1 2 3 4 5 6 7 8 9 10

MICH DNR ENVIRONMENTAL LAB
ORGANIC RESULTS FOR LAB LOG [illegible]

LAB# 54637 REC# 4534	ug/Kg ppb	SCAN 1	
	700.00	TRICHLOROETHENE	[illegible]
N SIDE	11.00	Detection limit	MM

LAB# 54[illegible] REC# 4869	ug/Kg ppb	SCAN 1	
	29000.00	TRICHLOROETHENE	COMMENT[illegible]
	720.00	Detection limit	DR MM

S SIDE

Unless noted above under COMMENTS, analyses [illegible] performed for the compounds on attached [illegible]. Concentrations are rounded to 2 significant [illegible]

Approved [signature]

DEC [illegible]

SCAN 3 - Chlorinated Hydrocarbons, PCBs & Organochlorine [illegible]

Aldrin
*Aroclor 1016
*Aroclor 1221
*Aroclor 1232
Aroclor 1242
*Aroclor 1248
Aroclor 1254
Aroclor 1260
*Aroclor 1262
*Aroclor 1268
g-BHC (lindane)
BP-6 (PBB)
a-Chlordane
g-Chlordane
2-Chloronaphthalene
4,4'-DDD
4,4'-DDE
1,4'-DDT
4,4'-DDT
1,2-Dichlorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
Heptachlor
Heptachlor epoxide
Hexabromobenzene
Hexachlorobenzene
Hexachlorobutadiene
Hexachlorocyclopentadiene
Hexachloroethane
Methoxychlor
Mirex
Pentachloronitrobenzene
*Toxaphene
1,2,4-Trichlorobenzene

SCAN 6 - Phthalate Esters & Polar Pesticides

Bis (2-ethylhexyl) phthalate
Butyl benzyl phthalate
Di-n-butyl phthalate
Diethyl phthalate
Dimethyl phthalate
Di-n-octyl phthalate
Dieldrin
Endosulfan I
Endrin

EL030

ORGANIC SCAN LIST
MATRIX: SEDIMENT/SOIL/SLUDGE
JANUARY 1985

SCAN 1 - Purgeable Halocarbons (Qualitative Headspace or Semi-Quantitative Leachate)

Carbon tetrachloride
Chlorobenzene
Chloroform
1,1-Dichloroethane
1,2-Dichloroethane
1,1-Dichloroethene
1,2-Dichloroethene (cis & trans)
1,2-Dichloropropane
1,3-Dichloropropene (cis & trans)
Methylene chloride (request only)
1,1,2,2-Tetrachloroethane
Tetrachloroethene
1,1,1-Trichloroethane
1,1,2-Trichloroethane
Trichloroethene

SCAN 2 - Purgeable Aromatic Hydrocarbons (Qualitative Headspace or Semi-Quantitative Leachate)

Benzene
Ethylbenzene
Styrene
Toluene
Xylene isomers (o, m, and p)

SCAN 3 - Chlorinated Hydrocarbons, PCBs & Organochlorine Pesticides

Aldrin
*Aroclor 1016
*Aroclor 1221
*Aroclor 1232
Aroclor 1242
*Aroclor 1248
Aroclor 1254
Aroclor 1260
*Aroclor 1262
*Aroclor 1268
g-BHC (lindane)
BP-6 (PBB)
a-Chlordane
g-Chlordane
2-Chloronaphthalene
4,4'-DDD
4,4'-DDE
1,4'-DDT
4,4'-DDT
1,2-Dichlorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
Heptachlor
Heptachlor epoxide
Hexabromobenzene
Hexachlorobenzene
Hexachlorobutadiene
Hexachlorocyclopentadiene
Hexachloroethane
Methoxychlor
Mirex
Pentachloronitrobenzene
*Toxaphene
1,2,4-Trichlorobenzene

SCAN 6 - Phthalate Esters & Polar Pesticides

Bis (2-ethylhexyl) phthalate
Butyl benzyl phthalate
Di-n-butyl phthalate
Diethyl phthalate
Dimethyl phthalate
Di-n-octyl phthalate
Dieldrin
Endosulfan I
Endrin

SUBJECT: Laboratory Result Remark Codes Most Commonly Used by Organic Lab

EFFECTIVE DATE: September 23, 1985

Below are the remark codes most frequently used when reporting data from the Organic Laboratory. A complete list of all available codes can be found in the Bureau's QA Manual as Appendix 1.C.-9.

The following single-letter STORET remark codes shall be used when reporting applicable laboratory results. The code appears in the comment column and should be included with values that are entered into the STORET system. Because only one STORET remark code can be stored at a time, the most pertinent must be used when more than one applies.

J Estimated value; value may not be accurate.

K Actual value is less than the value given. (Substance, if present, is below this level.)

M Presence of material verified but not quantified.

The following double-letter laboratory remark codes may also appear as comments. They are used to indicate why the laboratory has less confidence in a particular reported value. When more than one code is applicable, the more pertinent should be used. These codes are not compatible with STORET.

BK Reported value has been corrected for a laboratory blank which was greater than half of the detection limit but less than half of the reported value.

DL Sample was not analyzed using an optimum dilution.

DM Sample was diluted to reduce possible matrix interference.

DR High sample dilution was required to bring value into the analytical working range.

HT The recommended maximum laboratory holding time was exceeded before analysis.

LH Quality control indicated possible low recovery. The actual level may have been higher than the reported value.

LL Quality control indicated possible high recovery. The actual level may have been lower than the reported value.

LP Quality control indicated that the precision of the result may have been less than normal.

MM Analytical methodology has not been approved for the submitted sample matrix.

NA Analytical method has not yet been approved by laboratory.

PS Possible interference may have affected the accuracy of the laboratory result.

PT Recommended laboratory preservation technique not used.

SC Recommended laboratory sample container not used.

UC No attempt has been made to confirm the identity of the reported compound by a second independent technique due to equipment or sample problems.

The following triple-letter laboratory remark codes shall be used when no value is obtainable and STORET remark codes are inapplicable. These codes should not be stored in the STORET system. When more than one code is applicable, the more pertinent should be used.

ACC Laboratory accident resulted in no obtainable value.

BLK No value reported because the laboratory blank was greater than half of the detection limit and greater than half of the quantified value.

INT Interference encountered during analysis resulted in no obtainable value.

LSC Lack of proper sample container resulted in no sample suitable for analysis.

NAV Requested analysis not avaialble (lack of method or equipment, long-term equipment failure, etc.).

NOS No sample received suitable for analysis requested.

QNS Quantity not sufficient to perform requested analysis.

XHT No analysis performed or value reported because maximum recommended laboratory holding time was exceeded by a large margin.

APPROVED BY: John Peck
John Peck, Organic Unit Supervisor

APPENDIX B

SOIL BORINGS

Professional Service Industries, Inc.
Michigan Testing Engineers Division

July 13, 1984

Robert J. Davis, P.E.
Consulting Engineer
2410 Book Tower
Detroit, Michigan 48226

Re: Soils Investigation
Detrex Chemical Industries
Gold Shield Solvents
Grand Rapids, Michigan
PSI File No.: 406-45055

Dear Mr. Davis:

As requested, we have completed two (2) soil test borings for a new tank foundation and dyke at the above referenced location.

The soil borings were drilled to depths of twenty-five (25) feet below the existing ground surface at the approximate location shown on your sketch. Boring #1 had to be relocated to a location some five (5) feet east and ten (10) feet south of your proposed location.

Attached are copies of our soil boring logs for each location. In the area of boring #1, eight (8) feet of miscellaneous fill material was encountered.

The fill between a depth of five (5) feet and eight (8) feet was very loose and substantial settlements would be expected if new loads are placed in this area.

It is recommended that the fill be removed and replaced with engineered fill. If the new fill is placed in lifts and compacted to 95% of a modified proctor, it would be suitable of supporting up to 2500 pounds per square foot. If footings are placed at a depth of 8 feet or below, they could be designed for an allowable bearing capacity of 2500 pounds per square foot.

24355 Capitol Avenue • Detroit, MI 48239 • Phone: 313/255-4200

In the area of boring #2, the upper silty clay had relatively low standard penetration numbers, however, this soil would be able to support up to 1500 pounds per square foot with less than one inch of settlement.

If footings were placed at a depth of five feet six inches they could be designed with a net allowable bearing capacity of 3000 pounds per square foot.

Each of the borings were dry upon completion and only minor ground water seepage was encountered in the upper soils. No ground water problems are anticipated during construction.

As requested in your memo, we have checked the depth of the basement in the building adjacent to the tanks. The basement floor was found to be 8'8" below grade.

If you have any questions or need additional information please contact our office.

Respectfully submitted,

MICHIGAN TESTING ENGINEERS DIVISION

James H. Standen

James H. Standen, P.E.
Vice President

JHS/dgd

MICHIGAN TESTING ENGINEERS, INC.
CONSULTING ENGINEERS IN SOILS & FOUNDATIONS

LOG OF SOIL BORING NO. B-1

PROJECT Gold Shield Solvents

JOB NO. 406-45055

LOCATION 312 Elsworth Street
Grand Rapids, Michigan

SURFACE ELEV. -- DATE 7-3-84

Sample & Type	Depth	Legend	SOIL DESCRIPTION	Penetration Blows For 6"	Moisture %	Natural Wt. P.C.F.	Dry Den Wt. P.C.F.	Unc. Comp. Strength PSF.	Str. %
		0'6"	CONCRETE						
	1	1'0"	GRAVEL, coarse to fine, brown (FILL)						
	2	2'0"	FILL, black silty clay and cinders	9					
A			FILL, brown silty clay and brown coarse to fine sand and cinders	8	-	-	-	-	-
SS	3			6					
	4								
				2					
B	5			2	16.7	-	-	-	-
SS		5'6"		1					
	6		FILL, dark brown silty clay, occasional gravel, wood, coal						
	7			1					
C				1	17.9	113.8	96.5	-	-
SS	8	8'0"		1					
	9		Silty CLAY, some fine sand, brown						
				3					
D	10			3	15.5	122.5	106.1	3480	20.0
SS				5					
	11								
	12	12'6"							
	13		Fine SAND, brown						
	14								
				3					
E	15			3	11.7	-	-	-	-
SS				4					
	16								
	17	17'0"							
	18		Coarse to fine SAND and GRAVEL, brown, trace clayey silt, occasional cobble						
	19								
				5					
F	20			9	-	-	-	-	-
SS				5					
	21								
	22	22'0"							
	23		Layers brown silty CLAY and brown, coarse to fine sand, moist						
	24								
				9					
G	25			9	-	-	-	-	-
		25'6"	End of Boring	9					

TYPE OF SAMPLE
D. - DISTURBED
U.L - UNDIST. LINER
S.T - SHELBY TUBE
S.S - SPLIT SPOON
R.C - ROCK CORE
( ) - PENETROMETER

REMARKS:

Standard Penetration Test — Driving 2" OD Sampler 1' With

GROUND WATER OBSERVATIONS

G.W. ENCOUNTERED AT FT. INS.
G.W. ENCOUNTERED AT FT. INS.
G.W. AFTER COMPLETION FT. INS.
G.W. AFTER HRS. FT. INS.
G.W. VOLUMES None

MICHIGAN TESTING ENGINEERS, INC.
CONSULTING ENGINEERS IN SOILS & FOUNDATIONS

LOG OF SOIL BORING NO. B-2

JOB NO. 406-45055

PROJECT Gold Shield Solvents

LOCATION 312 Elsworth Street
Grand Rapids, Michigan

SURFACE ELEV. -- DATE 7-3-84

Sample & Type	Depth	Legend	SOIL DESCRIPTION	Penetration Blows For 6"	Moisture %	Natural Wt. P.C.F.	Dry Den Wt. P.C.F.	Unc. Comp. Strength PSF.	Str. %
		0'6"	CONCRETE						
	1	1'1"	Fine SAND, brown						
	2		Silty CLAY and fine SAND, brown	2					
A				3	14.7	116.1	101.2	-	-
SS	3			3					
	4								
				2					
B	5	5'5"		2	15.3	-	-	-	-
SS				3					
	6		Brown silty CLAY, little fine sand, occasional fine gravel						
	7			4					
C				5	13.2	123.6	109.2	4050	20.0
SS	8			7					
	9								
				4					
D	10			8	-	-	-	-	-
SS				9					
	11								
	12								
	13								
	14	14'0"							
				9					
E	15		Fine SAND, brown	11	11.2	-	-	-	-
SS				13					
	16								
	17	17'0"							
	18		Coarse to fine SAND and GRAVEL, brown, occasional cobble						
	19								
				12					
F	20			10	12.9	-	-	-	-
SS				14					
	21								
	22								
	23								
	24								
				5					
	25			5	-	-	-	-	-
		25'6"	End of Boring	7					

TYPE OF SAMPLE
D. - DISTURBED
U.L.-UNDIST. LINER
S.T - SHELBY TUBE
S.S - SPLIT SPOON
R.C - ROCK CORE
[illegible] - PENETROMETER

REMARKS:

Standard Penetration Test — Driving 2" OD Sampler 1' With
[illegible]

GROUND WATER OBSERVATIONS

G.W. ENCOUNTERED AT FT. INS.
G.W. ENCOUNTERED AT FT. INS.
G.W. AFTER COMPLETION FT. INS.
G.W. AFTER HRS. FT. INS.
[illegible] None

ATTACHMENT K-3

RESULTS OF
INVESTIGATION OF SOIL QUALITY

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

INTRODUCTION

EDI Engineering & Science was authorized in April, 1986 to conduct a study of the soil quality near the Gold Shield Solvents warehouse in Grand Rapids, Michigan. Gold Shield Solvents is a division of Detrex Chemical Industries, Inc. of Southfield, Michigan. The specific area of investigation is an open area on the east side of the Gold Shield Solvents building. The area is owned by the City of Grand Rapids and includes railroad tracks formerly owned by the C&O Railroad.

LOCATION

The Gold Shield Solvents warehouse is located at 312 Ellsworth Street in the southwest section of Grand Rapids. A map showing the building in relation to surrounding city streets and other features is shown in Figure 1. The warehouse is located in an industrial/commercial area immediately west of the US-131 expressway and north of Wealthy Street.

The entire warehouse is confined to one building facing due west. Figure 2 depicts the details of the building site. An old C&O Railroad spur lies near the eastern boundary of the building. Beyond the area of investigation, east of the railroad spur, are additional railroad tracks formerly owned by the C&O.

BACKGROUND

Detrex Chemical Industries is involved in the reclamation and reselling of industrial solvents. The Gold Shield Solvents warehouse in Grand Rapids reclaims and resells solvents at a ratio of approximately 70% trichloroethylene and 30% 1,1,1-trichloroethane. This warehouse sells a very small amount of tetrachloroethylene (approximately 24 drums per year). Tetrachloroethylene is not reclaimed at the warehouse.

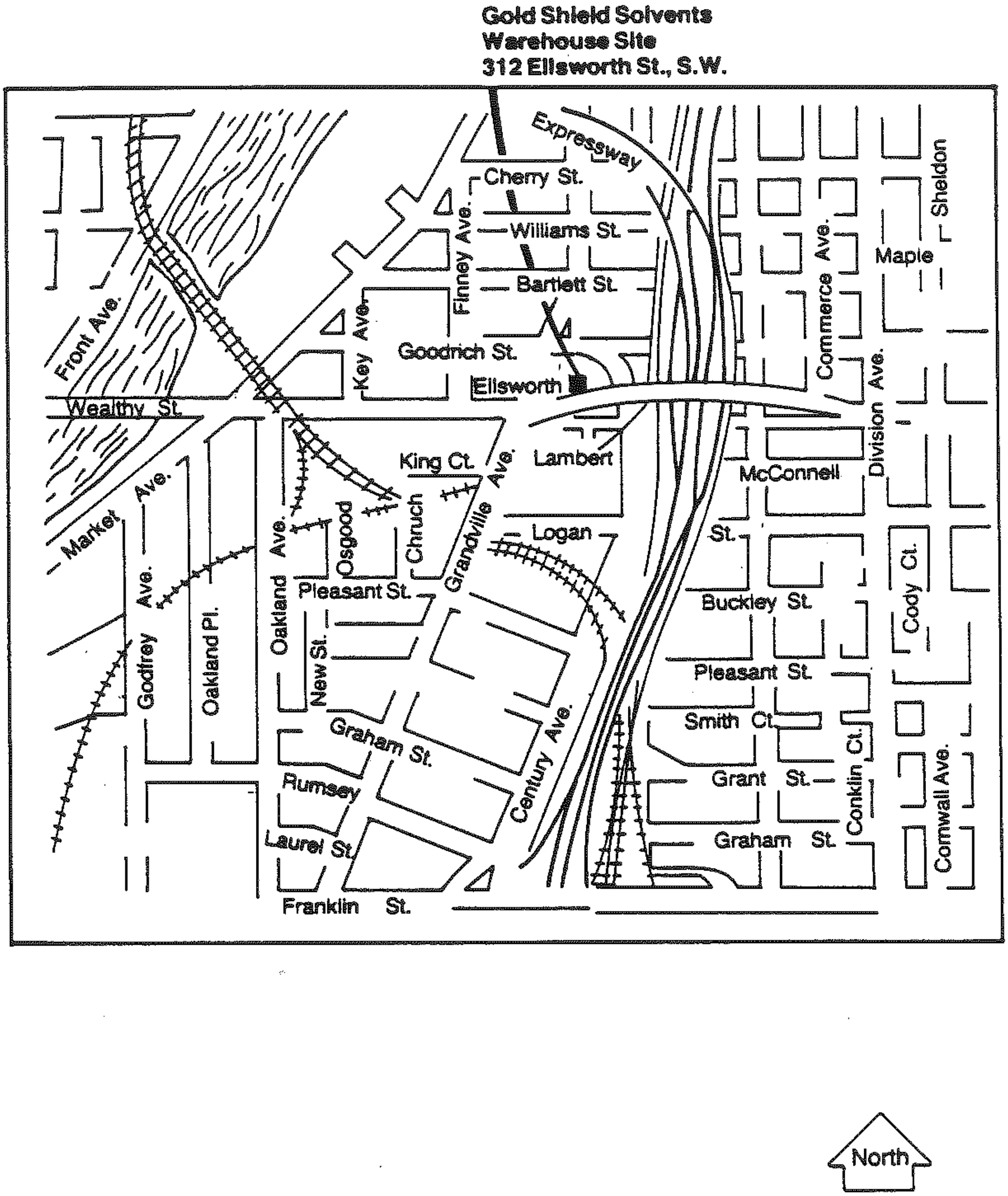


Figure 1

Location Map of the Warehouse Site

Gold Shield Solvents
Grand Rapids, Michigan

May, 1986 20510

EDI Engineering & Science

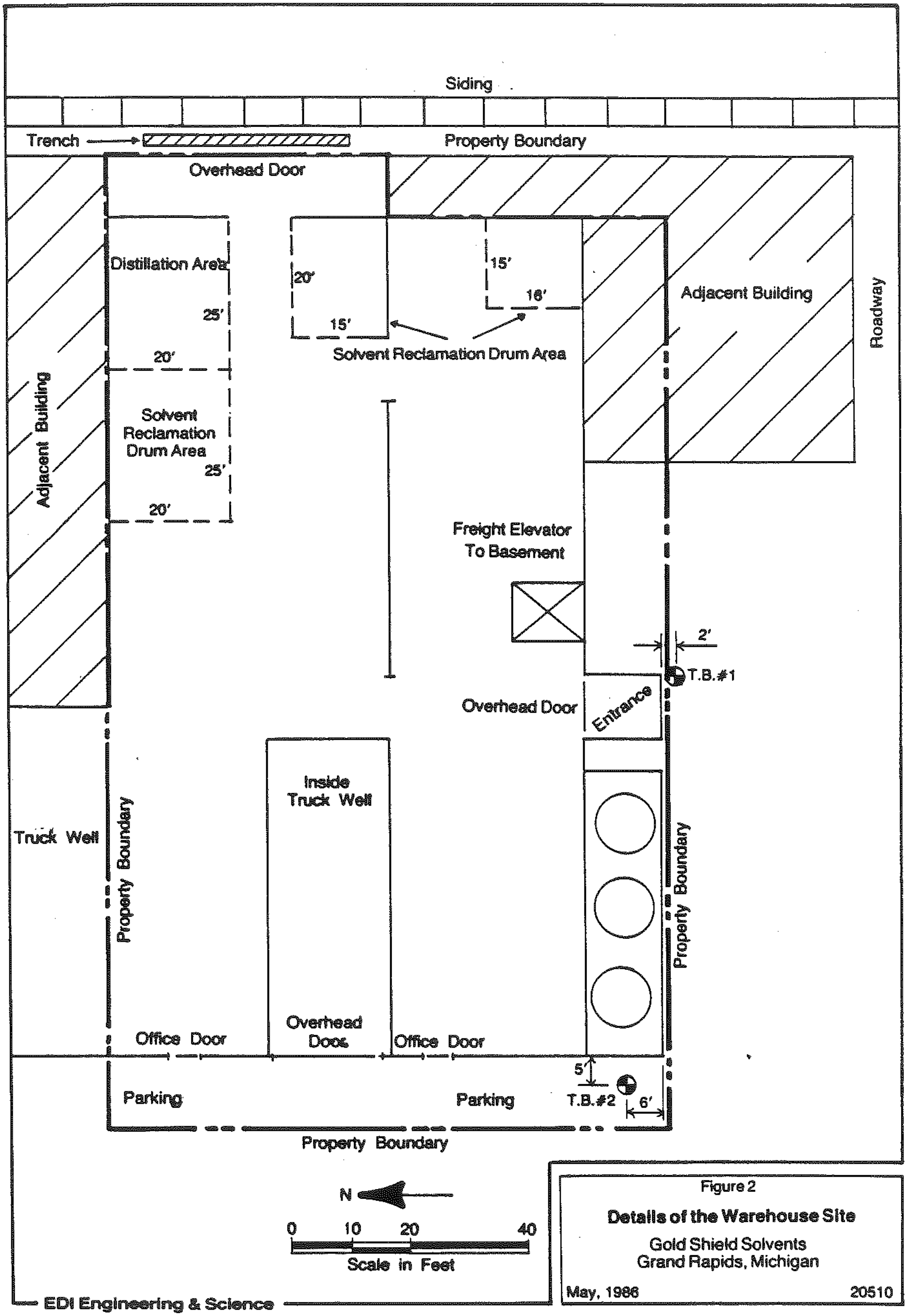


Figure 2

Details of the Warehouse Site

Gold Shield Solvents
Grand Rapids, Michigan

May, 1986 20510

In November, 1985, personnel from the Michigan Department of Natural Resources (MDNR) discovered stains at the soil surface between the plant building and the nearest rail spur during a routine visit. At the request of the MDNR, Gold Shield excavated a trench a few feet wide and about 34 feet long between the building and the rail spur (Figure 2). The trench was excavated to a depth of approximately 3 feet.

A soil sample was recovered from the bottom of the trench by MDNR personnel during early November, 1985. The sample was taken at the east wall of the trench opposite the south edge of the overhead door. Laboratory analysis of the soil sample indicated the presence of 4.8 ppm of tetrachloroethylene, 5.5 ppm of 1,1,1-trichloroethane, and 2,500 ppm of trichloroethylene.

A post hole dug about 10 feet east of the east trench wall and at a depth of about 3 feet produced soil samples with a concentration of 710 ppm of trichloroetheylene.

The trench was deepened to the present depth of about 5 feet during November, 1985. Two additional soil samples were taken at the bottom of the northeastern and southeastern corners of the trench on November 20, 1985. The sample analyses indicated concentrations of 0.7 and 29 ppm of trichloroethylene in these respective locations. The laboratory analytical results are presented in Appendix A.

On November 21, 1985 the MDNR requested that Gold Shield determine the extent of the soils that were impacted by solvents common to the warehouse operation. The objective of the report was to identify the horizontal and vertical extent of contamination of the soil, and to determine if there is potential for the solvents to have reached groundwater.

In an unrelated study, two soil borings were made for Gold Shield Solvents by Professional Services Industries, Inc. during July, 1984. The soil tests were conducted for a new tank foundation and dike on the southwest side of the building. The soil borings are designated as TB #1 and TB #2 and are shown in Figure 2. Details of these soil borings and the soil borings constructed by EDI in April, 1986 are shown in Appendix B.

METHODS OF INVESTIGATION

A total of 17 soil borings were drilled east of the Gold Shield building between the east wall and the railroad tracks during April, 1986 (Figure 3). One of the soil borings is a control boring that was drilled outside of any anticipated contaminated area, solely to determine background. The control boring was constructed to obtain a representative vertical soil profile and to determine the permeability of the lower clay bed that was subsequently verified at approximately 7 feet below the surface. The other 16 soil borings were drilled to determine the extent of soil contamination, if any, in the soil or fill above the lower clay layer.

The soil borings constructed by EDI were drilled using a hollow-stem auger, and split spoon cores were collected continuously from the surface to the total depth of penetration. As each split spoon core was recovered at the surface, it was opened and immediately scanned with an HNU photoionization detector calibrated for trichloroethylene.

The HNU instrument has a probe that draws solvent vapors into the unit where UV excitation results in fluorescence (10.2 ev lamp, P/N 100009-A1) allowing the concentration to be recorded on a meter calibrated in parts per million (ppm). The HNU detector actually responds to all of the solvent vapors present. The meter indicated the total concentration of solvent vapors as an equivalent concentration of trichloroethylene.

The HNU probe was passed over the entire length of the split spoon cores. The soil cores varied in recovery length from 0.5 foot to 2 feet. The cores were broken at various points along the spoon, and soil particles were spread apart so that the detector could pick up fresh solvent vapors emanating from the soil. The HNU detector was passed over the cores immediately above the

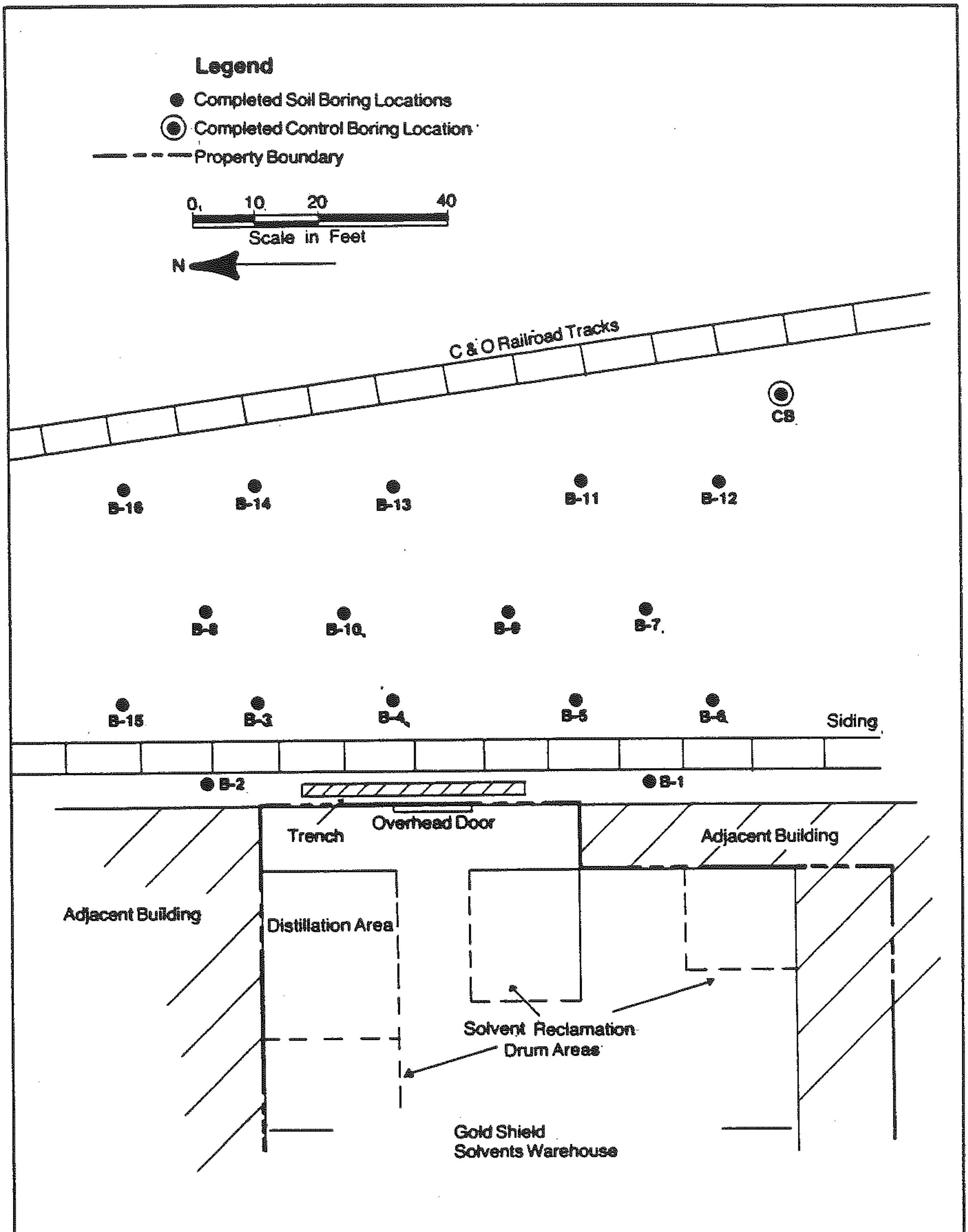


Figure 3

Grid System for Completed Soil Borings

Gold Shield Solvents
Grand Rapids, Michigan

May, 1986 20510

EDI Engineering & Science

soil. Care was taken to insure that the soil particles were not aspirated by the HNU probe itself.

Soil samples consisting of composites collected along the entire length of the soil cores were placed in VOA vials, capped, and placed in a cooler containing blue ice. The samples were then returned to EDI's laboratory and immediately placed in a refrigerator prior to their analysis.

Soil samples were selected for laboratory analysis as follows: two samples from the control boring; two samples with low HNU readings; two samples with medium HNU readings; three samples lacking detection with the HNU; three samples near the railroad tracks (B-13, B-14 and B-16); and seven samples selected to complete a thorough survey of the area occupied by the borings.

The split spoon core barrels were steam cleaned and rinsed with deionized water after every sample. It was not necessary to give the split spoon samplers an acetone rinse due to the fact that a free liquid phase of solvents was not encountered. The auger stems and lead augers were thoroughly steam cleaned after each boring.

The control boring was drilled to a depth of 13 feet. The other soil borings varied from 6 feet to 9 feet in depth. The soil borings were specifically designed to provide for minimal entry into the top of the lower clay.

Four brass liner samples were recovered from the lower clay layer in the control boring to facilitate the laboratory measurement of permeability. Samples were recovered from 7.25 to 7.5 feet, 8.5 to 8.75 feet, 8.75 to 9.0 feet, and 9.0 to 10.0 feet. The brass liners are fitted inside the split spoons to collect the soil samples.

The brass liner samples from the control boring were taken to EDI's soils laboratory where the samples were remolded and sealed against the walls of the brass liners for measurement of permeability[1]. The samplers were remolded to the extent necessary to eliminate channelization between the soil and the side of the brass liners. A portion of the field sample of approximately 1 to 1-1/2 inches in length was used in the permeability test. Permeabilities were determined using the falling head method and a form of Darcy's law. The falling head method utilizes the principle of a falling head of water above the sample measured over a certain period of the time. A low head loss is a reflection of a low permeability.

The elevation of the ground was determined at each of the soil boring locations using standard instrument surveying techniques. The elevation of the plant floor at the center of the overhead door on the east side of the building was picked as an arbitrary elevation of 100 feet. All of the soil borings have elevations that are measured in relation to the 100-foot plant datum. The elevations of the borings are relative elevations instead of NGVD elevations. This technique is suitable for a shallow investigation of soil quality.

Laboratory analysis of soil samples was accomplished according to EPA Method 8240. A purge and trap technique is employed to remove the volatile compounds from the sample. Gas chromatography/mass spectrometry is used to analyze the compounds. The use of an internal standard and quality assurance/quality control practices are employed to verify the quality of the laboratory data that are generated.

---

[1] Remolding requires a minimum amount of recompaction in the laboratory to achieve a seal of the clay sample against the permeameter walls. This may result in some decrease in permeability.

FINDINGS

GEOLOGY

The study area occupies part of a broad area of glacial materials consisting principally of sand and gravel interspersed with clay beds. The two soil borings that were constructed for Gold Shield Solvents during July, 1984 encountered 5 to 8 feet of fill over 4 to 8 feet of silty clay. The silty clay layer is underlain by 3 to 5 feet of fine-grained sand. At the bottom of the borings at the 25-foot level, sand and gravel were encountered with lesser amounts of silt and clay. Groundwater was not noted in either boring.

A series of four cross sections was constructed through the soil borings that were drilled by EDI during April, 1986. The locations of the cross sections are shown in Figure 4. Cross sections A-A′ and B-B′ are illustrated in Figure 5 and cross sections C-C′ and D-D′ are illustrated in Figure 6. The lower clay that is highlighted on the cross sections is the lower-most clay unit that was encountered in the soil borings drilled by EDI.

The fill above the lower clay layer varies in thickness from 3 to 7.3 feet. It consists of erratic and discontinuous beds of sand, clay, black cinders, and gravel. The black cinder zone that is located at or near the surface is illustrated on the cross sections. This cinder zone is composed of charcoal and charred wood and is relatively continuous. However, it is not present in borings B-6 and B-10. The discontinuous nature of the clay and sand layers and additional layers of black cinders above the lower clay is typical of an area that has fill material instead of natural soils.

The lower clay layer that is shown at the bottom of the cross sections was encountered at a depth varying from 4 to 7.8 feet. The lower clay layer is described as follows: clay, occasionally silty to sandy, soft, mottled tan to gray to yellow-brown. All of the borings penetrated into the top of the clay.

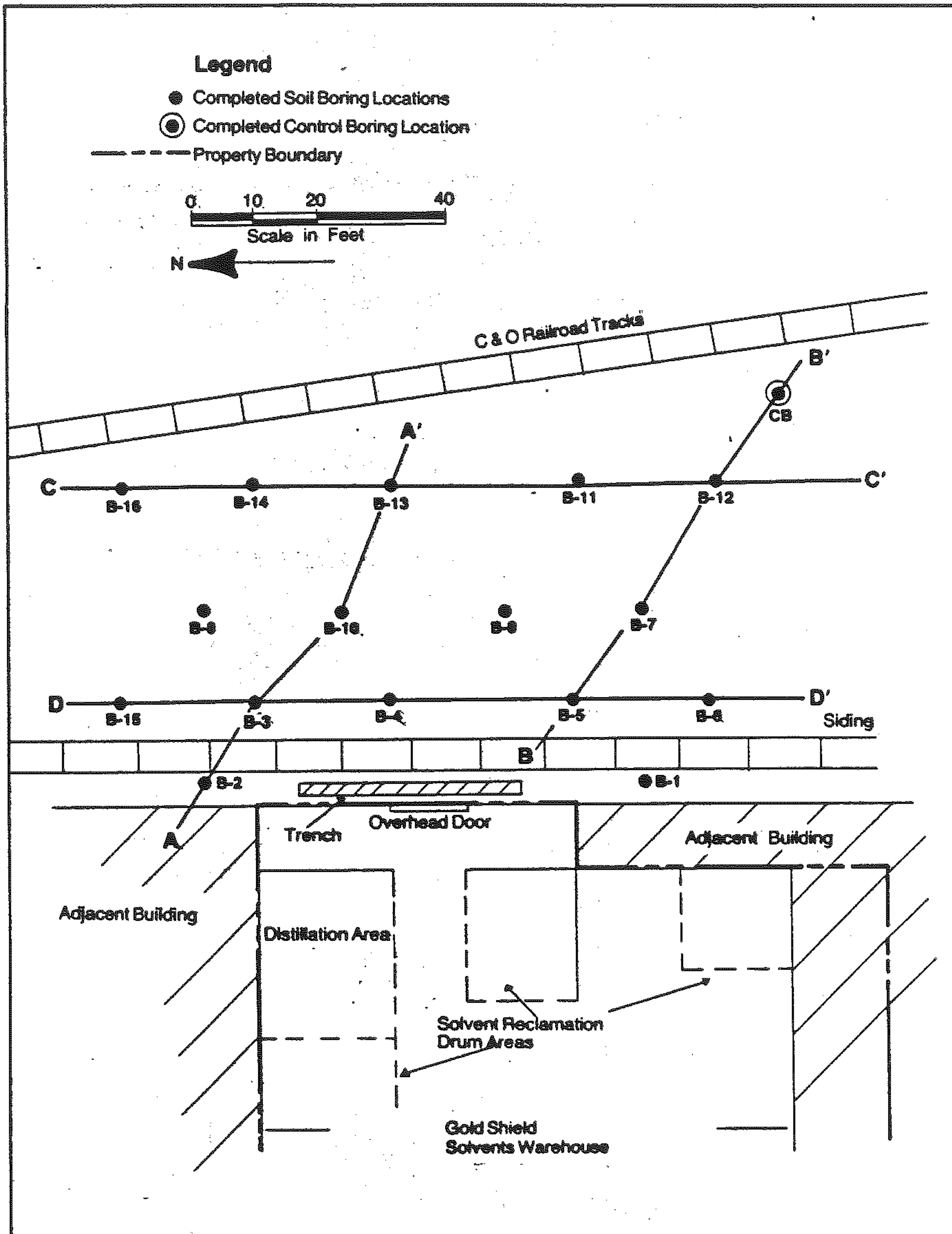


Figure 4

Locations of Cross Sections

Gold Shield Solvents
Grand Rapids, Michigan

May, 1986 20510

EDI Engineering & Science

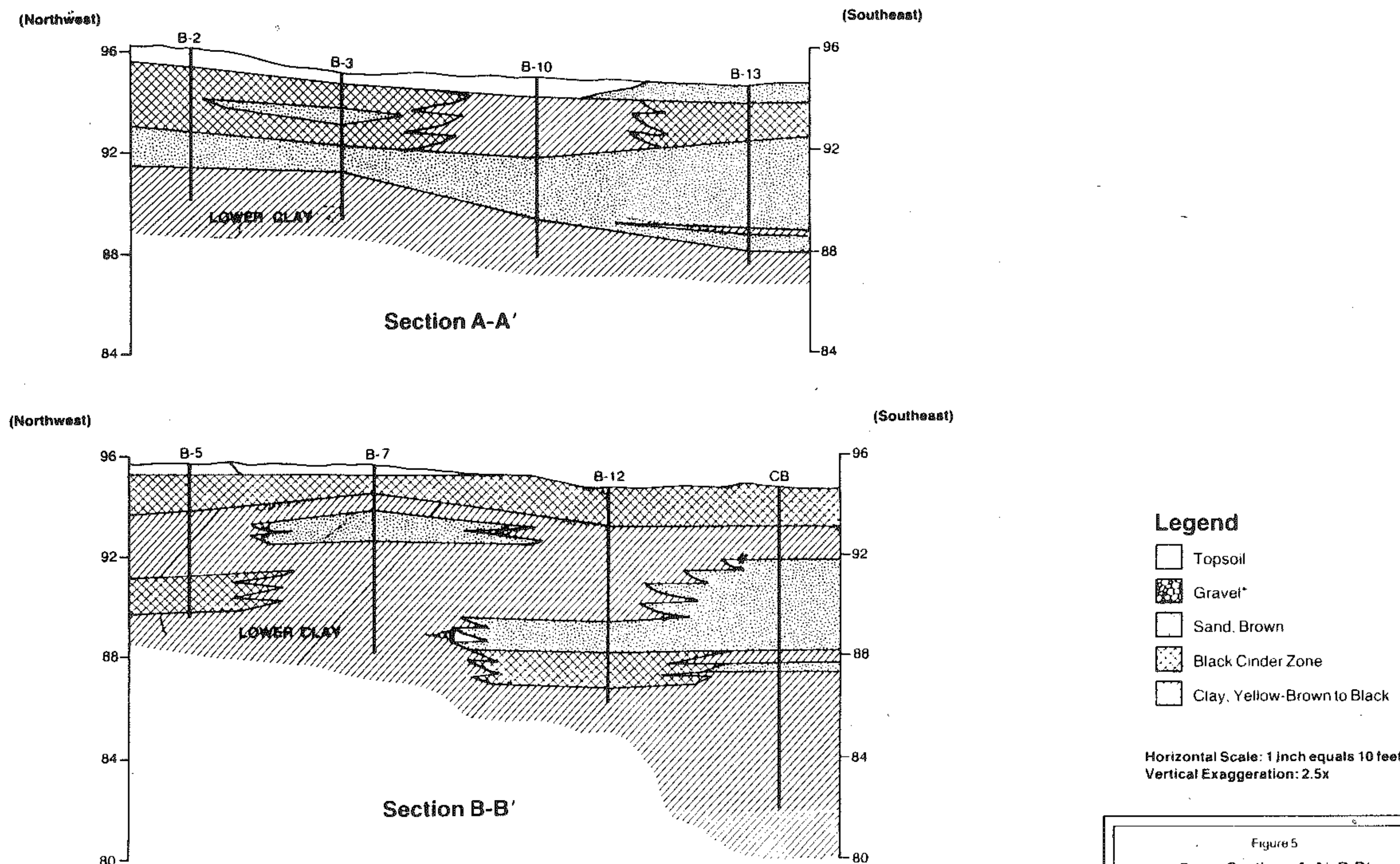


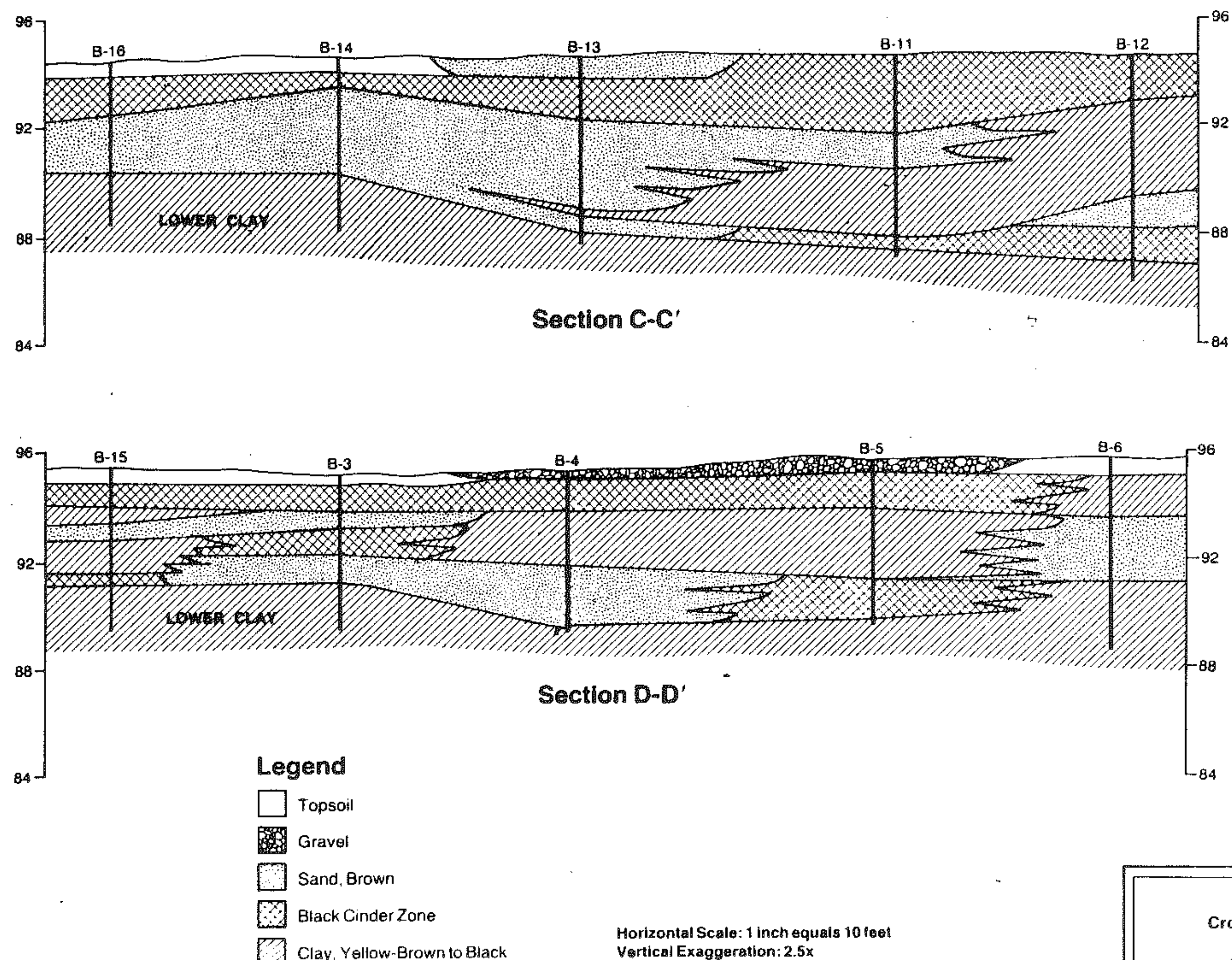
Figure 5

Cross Sections A-A', B-B'

Gold Shield Solvents
Grand Rapids, Michigan

May, 1986 20510

EDI Engineering & Science



Horizontal Scale: 1 inch equals 10 feet
Vertical Exaggeration: 2.5x

Figure 6

Cross Sections C-C′, D-D′

Gold Shield Solvents
Grand Rapids, Michigan

May, 1986 20510

EDI Engineering & Science

TABLE 1

LABORATORY MEASURED PERMEABILITIES OF THE
LOWER CLAY LAYER IN THE CONTROL BORING

GOLD SHIELD SOLVENTS
GRAND RAPIDS, MICHIGAN

BORING	SAMPLE DEPTH (feet)	PERMEABILITY* (cm/sec)
Control	7.25 - 7.5	1.8×10^{-8}
Control	8.5 - 8.75	1.3×10^{-8}
Control	8.75 - 9.0	1.3×10^{-8}
Control	9.0 - 10.0	2.5×10^{-8}

---

*Permeability measured in the laboratory using the falling head method.

Section B-B′ (Figure 5) shows the cross-section of the upper 5.5 feet of the lower clay layer in the control boring. The permeabilities of the four brass liner samples recovered from the lower clay layer are shown in Table 1, and the data sheets are shown in Appendix C. The permeability of the lower clay in the control boring varies from 1.3 X 10^{-8} cm/sec to 2.5 X 10^{-8} cm/sec. These data are typical of clays with very low permeabilities. The permeability data suggest high resistance to vertical movement through the lower clay layer.

SOIL ANALYSES

A total of 78 split spoon samples was screened with the HNU photoionization detector. The field results are shown in Table 2. A concentration of 0.5 ppm in Table 2 was the background level at the time and location of sampling. Nineteen of the original 78 samples were selected for laboratory analysis of trichloroethylene, 1,1,1-trichloroethane, and tetrachloroethylene. These samples are highlighted in Table 2. The results of the laboratory analyses of the soil samples are shown on Table 3 and the data sheets can be found in Appendix D.

The HNU detector actually reads total solvents present, which in this case includes trichloroethylene, 1,1,1-trichloroethane, and tetrachloroethylene. However, 1,1,1-trichloroethane and tetrachloroethylene are present in much smaller concentrations than trichloroethylene, as shown in Table 3. A good example is the laboratory results for boring B-1 from 2 to 4 feet. The trichloroethylene concentration is 560 mg/kg, the 1,1,1-trichloroethane concentration is 0.13 mg/kg, and the tetrachloroethylene concentration is 0.24 mg/kg. Therefore, for practical purposes, the discussion of trichloroethylene may be taken as the sum of the three compounds.

A comparison of the concentrations found in the field and the concentrations found in the laboratory indicates that there is general agreement between the field and the laboratory results. But at low concentrations, some of the samples show detection levels by one method and not the other. For example,

TABLE 2

SAMPLE DEPTHS AND FIELD DETERMINED
TRICHLOROETHYLENE CONCENTRATIONS
FOR BORINGS DRILLED APRIL 23 TO 25, 1986

GOLD SHIELD SOLVENTS
GRAND RAPIDS, MICHIGAN

BORING	SAMPLE NO.	SAMPLE DEPTH (feet)	SAMPLE CONCENTRATION* (ppm)
Control	1	1.0 - 1.5	0.5
Control	2	1.5 - 2.0	2.0
Control	3	2.0 - 3.0	0.5
Control	4L	3.0 - 3.5	0.5
Control	5L	4.0 - 5.0	0.5
Control	6L	6.5 - 7.0	0.5
Control	7P	6.0 - 6.5	0.5
Control	8P	7.25 - 7.5	0.5
Control	9P	8.5 - 8.75	0.5
Control	10P	8.75 - 9.0	0.5
Control	11P	9.0 - 10.0	0.5
Control	12	9.0 - 10.0	0.5
Control	13	10.0 - 11.0	0.5
Control	14	11.0 - 12.0	0.5
Control	15	12.0 - 12.5	0.5
Control	16	12.8 - 13.0	0.5
B-1	60L	0.0 - 2.0	1000
B-1	61L	2.0 - 4.0	1000
B-1	62	4.0 - 6.0	500
B-1	63	6.0 - 7.0	600
B-2	73	0.0 - 2.0	5.5
B-2	74	2.0 - 4.0	0.5
B-2	75L	4.0 - 6.0	0.5
B-3	70L	0.0 - 2.0	6.0
B-3	71L	2.0 - 4.0	0.5
B-3	72L	4.0 - 6.0	0.5
B-4	67L	0.0 - 2.0	1200
B-4	68L	2.0 - 4.0	300
B-4	69L	4.0 - 6.0	70
B-5	64	0.0 - 2.0	500
B-5	65L	2.0 - 4.0	140
B-5	66L	4.0 - 6.0	100
B-6	56	0.0 - 2.0	45
B-6	57	2.0 - 4.0	110
B-6	58L	4.0 - 6.0	60
B-6	59L	6.0 - 7.0	200

BORING	SAMPLE NO.	SAMPLE DEPTH (feet)	SAMPLE CONCENTRATION* (ppm)
B-7	52	0.0 - 2.0	0.5
B-7	53	3.0 - 5.0	0.5
B-7	54[L]	6.0 - 7.0	0.5
B-7	55	7.0 - 7.5	0.5
B-8	39[L]	0.0 - 2.0	0.5
B-8	40	2.0 - 4.0	0.5
B-8	41	4.0 - 6.0	0.5
B-8	42	7.0 - 7.5	0.5
B-9	47[L]	0.0 - 2.0	15.0
B-9	48	2.0 - 4.0	1.5
B-9	49	4.0 - 6.0	2.0
B-9	50	6.0 - 7.0	3.5
B-9	51	7.0 - 8.0	2.5
B-10	43	0.0 - 2.0	2.0
B-10	44	2.0 - 4.0	1.5
B-10	45	4.0 - 6.0	1.0
B-10	46[L]	6.0 - 7.0	1.0
B-11	23	0.0 - 2.0	0.5
B-11	24	2.0 - 4.0	0.5
B-11	25[L]	4.0 - 6.0	0.5
B-11	26	6.0 - 7.0	0.5
B-11	27	7.0 - 7.5	0.5
B-12	17[L]	0.5 - 2.0	1.0
B-12	18	2.0 - 4.0	0.5
B-12	19	5.0 - 6.0	1.0
B-12	20	6.5 - 7.5	0.5
B-12	21	7.5 - 8.0	0.5
B-12	22	8.0 - 8.5	0.5
B-13	28[L]	0.0 - 2.0	20.0
B-13	29	2.0 - 4.0	2.0
B-13	30	4.0 - 6.0	5.0
B-13	31	6.0 - 7.0	2.0
B-14	32[L]	0.0 - 2.0	70.0
B-14	33	2.0 - 4.0	25.0
B-14	34	4.0 - 6.0	8.0
B-14	35	6.0 - 6.5	0.5
B-15	76	0.0 - 2.0	0.5
B-15	77	2.0 - 4.0	0.5
B-15	78[L]	4.0 - 6.0	3.0
B-16	36[L]	0.0 - 2.0	50.0
B-16	37	2.0 - 4.0	3.0
B-16	38	4.0 - 6.0	0.5

* Sample concentrations determined in the field using a photoionization detector (HNU) with 10.2 eV lamp model P/n 100009-Al calibrated for trichloroethylene. Background is 0.5 ppm

L Sample used for chemical analysis in the laboratory.

P Used to measure permeability of the clay layer.

TABLE 3

RESULTS OF CHEMICAL ANALYSES
OF SOIL SAMPLES

GOLD SHIELD SOLVENTS
GRAND RAPIDS, MICHIGAN

(concentrations in mg/kg)

BORING	DEPTH (feet)	TRICHLORO-ETHYLENE	1,1,1-TRICHLORO-ETHANE	TETRACHLORO-ETHYLENE	HNU READINGS
Control	4.0 - 5.0	ND*	ND	ND	0.5
Control	6.5 - 7.0	ND	ND	ND	0.5
B-1	2.0 - 4.0	560	0.13	0.24	1000
B-3	0.0 - 2.0	0.10	ND	ND	6.0
B-3	4.0 - 6.0	ND	ND	ND	0.5
B-4	0.0 - 2.0	77	0.43	5.4	1200
B-4	4.0 - 6.0	7.1	ND	0.47	70
B-5	4.0 - 6.0	77	ND	ND	100
B-6	6.0 - 7.0	84	ND	ND	200
B-7	6.0 - 7.0	0.14	ND	ND	0.5
B-8	0.0 - 2.0	0.091	ND	ND	0.5
B-9	0.0 - 2.0	15	0.061	0.020	15
B-10	6.0 - 7.0	0.20	ND	ND	1.0
B-11	4.0 - 6.0	ND	ND	ND	0.5
B-12	0.5 - 2.0	ND	ND	ND	1.0
B-13	0.0 - 2.0	32	0.041	ND	20
B-14	0.0 - 2.0	370	ND	ND	70
B-15	4.0 - 6.0	ND	ND	ND	3
B-16	0.0 - 2.0	89	ND	ND	50

*Compound not detected at the detection limit of 0.020 mg/kg.

boring B-8 from 0 to 2 feet had 0.091 mg/kg in the laboratory and none in the field. Boring B-7 from 6 to 7 feet had 0.14 mg/kg in the laboratory and none in the field. Boring B-15 from 4 to 6 feet measured 3 ppm in the field but there was no detection in the laboratory.

CONCLUSIONS

- The study area occupies part of a broad area of glacial materials consisting of sand and gravel interspersed with clay beds. The soil borings drilled by EDI encountered 3 to 7 feet of fill over a natural clay bed. The clay bed has a very low permeability on the order of 1.3×10^{-8} cm/sec to 2.5×10^{-8} cm/sec.

- An evaluation was made of the analyses of various samples comparing results obtained with the HNU field instrument versus the laboratory GC/MS procedure. This evaluation indicates several samples having HNU results at 1.0 and 3.0 mg/kg (0.5 and 2.5 mg/kg over "background") showed no detectable results on the GC/MS (which has a sensitivity of 0.02 mg/kg). Several samples which had analyses of 0.5 mg/kg ("background") using the HNU instrument, gave results of up to 0.14 mg/kg on the GC/MS. Other samples at 0.5 mg/kg with the HNU field test gave non-detectable results when tested on the GC/MS.

- The concentration levels of samples taken from locations B-1, B-4, B-5, B-6, B-14, and B-16 are such that excavation may be indicated at these boring locations.

- The two boring locations near the C&O tracks, B-14 and B-16, are some distance away from the Gold Shield warehouse, and near the C&O tracks. Gold Shield advises they never used the C&O tracks for loading or unloading solvents. The location of B-14 and B-16, as well as the analyses from adjacent borings, suggest a possible surface source other than from Gold Shield.

- In view of the analyses at locations B-1 and B-6, several additional borings are planned south of these locations.

Appendix A Analytical Results for 1985
Appendix A Analytical Results for 1985
Appendix A Analytical Results for 1985
Appendix A Analytical Results for 1985
Appendix A Analytical Results for 1985
Appendix A Analytical Results for 1985
Appendix A Analytical Results for 1985
Appendix A Analytical Results for 1985
Appendix A Analytical Results for 1985
Appendix A Analytical Results for 1985
Appendix A Analytical Results for 1985
Appendix A Analytical Results for 1985
Appendix A Analytical Results for 1985
Appendix A Analytical Results for 1985
Appendix A Analytical Results for 1985
Appendix A Analytical Results for 1985

LAB LOG# 7349 PROJ CODE ______ COST CENTER 3411 90175 PR II RECEIVED AT LAB RGJ DATE TIME 11/4/85 1445

LOCATION SAMPLED GOLD SHIELD SOLVENTS COLLECTED BY A. PRZYBYLA TRANSFERED TO [illegible]

SAMPLE REMARKS AMT. OF ORGANIC FREE WATER ADDED IS ON BOTTLE LABEL SEND RESULTS TO (NAME & SECTION) A. PRZYBYLA, GQD, GRAND RAPIDS

LAB USE ONLY	#	FIELD ID OR DESCRIPTION	SAMPLE INFORMATION	YY/MM/DD	HH:MM
54256	01	IN HOLE		11/1/85	
54257	02	POST HOLE	NOV [illegible] 1985		
	03		DISTRICT 9		
	04				
	05				
	06				
	07				
	08				
	09				
	10				

ORGANIC CONTAMINANTS

POS1* #1 HALOCARBONS.................... $\boxed{1\ 2}$ 3 4 5 6 7 8 9 10

POS2* #2 AROMATIC HYDROCARBONS.......... 1 2 3 4 5 6 7 8 9 10

OS #3 CL HC & PESTICIDES & PCB....... 1 2 3 4 5 6 7 8 9 10
#6 PHTHALATES...................... 1 2 3 4 5 6 7 8 9 10
#7 PNA............................. 1 2 3 4 5 6 7 8 9 10
.... 1 2 3 4 5 6 7 8 9 10
.... 1 2 3 4 5 6 7 8 9 10
.... 1 2 3 4 5 6 7 8 9 10

OS OIL & GREASE - IR................. 1 2 3 4 5 6 7 8 9 10
OIL & GREASE - GRAVIMETRIC........ 1 2 3 4 5 6 7 8 9 10

.... 1 2 3 4 5 6 7 8 9 10
.... 1 2 3 4 5 6 7 8 9 10
.... 1 2 3 4 5 6 7 8 9 10

GENERAL CHEMISTRY

MS COD............................. 1 2 3 4 5 6 7 8 9 10
KJELDAHL NITROGEN, TOTAL PHOS..... 1 2 3 4 5 6 7 8 9 10
PHENOLICS......................... 1 2 3 4 5 6 7 8 9 10
TOTAL CYANIDE..................... 1 2 3 4 5 6 7 8 9 10
TOTAL SOLIDS...................... 1 2 3 4 5 6 7 8 9 10
.... 1 2 3 4 5 6 7 8 9 10

INORGANIC CONTAMINANTS

MS CA MG NA K........................ 1 2 3 4 5 6 7 8 9 10
.... 1 2 3 4 5 6 7 8 9 10
CD CR CU NI PB ZN................. 1 2 3 4 5 6 7 8 9 10
.... 1 2 3 4 5 6 7 8 9 10
AS ARSENIC........................ 1 2 3 4 5 6 7 8 9 10
HG MERCURY........................ 1 2 3 4 5 6 7 8 9 10
SB ANTIMONY....................... 1 2 3 4 5 6 7 8 9 10
.... 1 2 3 4 5 6 7 8 9 10
AL ALUMINUM....................... 1 2 3 4 5 6 7 8 9 10
CO COBALT......................... 1 2 3 4 5 6 7 8 9 10
FE IRON........................... 1 2 3 4 5 6 7 8 9 10
LI LITHIUM........................ 1 2 3 4 5 6 7 8 9 10
MN MANGANESE...................... 1 2 3 4 5 6 7 8 9 10
MO MOLYBDENUM...................... 1 2 3 4 5 6 7 8 9 10
TI TITANIUM....................... 1 2 3 4 5 6 7 8 9 10
V VANADIUM........................ 1 2 3 4 5 6 7 8 9 10
.... 1 2 3 4 5 6 7 8 9 10
.... 1 2 3 4 5 6 7 8 9 10
.... 1 2 3 4 5 6 7 8 9 10

.... 1 2 3 4 5 6 7 8 9 10
.... 1 2 3 4 5 6 7 8 9 10
.... 1 2 3 4 5 6 7 8 9 10
.... 1 2 3 4 5 6 7 8 9 10

ORGANIC RESULTS FOR LAB LOG #7349

LAB# 54256 REC# 3878	ug/Kg ppb	SCAN 1	COMMENTS
	5500.00	1*1*1-TRICHLOROETHANE	UC ALL DR
	2500000.00	TRICHLOROETHENE	* * * *
	4800.00	TETRACHLOROETHENE	UC
	1100.00	Detection limit	

LAB# 54257 REC# 3879	ug/Kg ppb	SCAN 1	COMMENTS
	710000.00	TRICHLOROETHENE	DR
	9900.00	Detection limit	

Unless noted above under COMMENTS, analyses were performed for the compounds on attached scan list. Concentrations are rounded to 2 significant figures.

Approved [signature]
NOV 13 1985

RECEIVED
GROUNDWATER QUALITY DIV
NOV - 1985
DISTRICT 9
GRAND RAPIDS

ELUOU

LOG#   MICHIGAN DEPT OF NATURAL RESOURCES   ENVIRONMENTAL LABORATORY   INFO ON BACK
MATRIX = SEDIMENT/SOIL   ANALYSIS REQUEST SHEET   ***** SAFETY WARNING *****

LAB LOG# 7447 | PROJ CODE | COST CENTER 3411 / 42323 | PR II | RECEIVED AT LAB | DATE TIME 11/20/85 1355

LOCATION SAMPLED: GOLD SHIELD SOLVENTS | COLLECTED BY: A PRZYBYLA | TRANSFERED TO:

SAMPLE REMARKS: | SEND RESULTS TO (NAME & SECTION): A. PRZYBYLA

LAB USE ONLY	O#	FIELD ID OR DESCRIPTION	SAMPLE INFORMATION	YY/MM/DD	HHMM
54697	01	N. BOTTOM HOLE		85/11/19	
54698	02	S. BOTTOM HOLE		↓	
	03				
	04				
	05				
	06				
	07				
	08				
	09				
	10				

RECEIVED
GROUNDWATER QUALITY DIV.
DEC 1985
DISTRICT 9
GRAND RAPIDS

ORGANIC CONTAMINANTS

POB1* 01 HALOCARBONS.................... 1 2 3 4 5 6 7 8 9 10
POB2* 02 AROMATIC HYDROCARBONS.......... 1 2 3 4 5 6 7 8 9 10
OB 03 CL HC & PESTICIDES & PCB....... 1 2 3 4 5 6 7 8 9 10
04 PHTHALATES..................... 1 2 3 4 5 6 7 8 9 10
07 PNA............................ 1 2 3 4 5 6 7 8 9 10
.... 1 2 3 4 5 6 7 8 9 10
.... 1 2 3 4 5 6 7 8 9 10
.... 1 2 3 4 5 6 7 8 9 10
OE OIL & GREASE - IR................ 1 2 3 4 5 6 7 8 9 10
OIL & GREASE - GRAVIMETRIC........ 1 2 3 4 5 6 7 8 9 10
.... 1 2 3 4 5 6 7 8 9 10
.... 1 2 3 4 5 6 7 8 9 10
.... 1 2 3 4 5 6 7 8 9 10

INORGANIC CONTAMINANTS

HS CA MG NA K....................... 1 2 3 4 5 6 7 8 9 10
.... 1 2 3 4 5 6 7 8 9 10
CD CR CU NI PB ZN................. 1 2 3 4 5 6 7 8 9 10
.... 1 2 3 4 5 6 7 8 9 10
AS ARSENIC........................ 1 2 3 4 5 6 7 8 9 10
HG MERCURY........................ 1 2 3 4 5 6 7 8 9 10
SB ANTIMONY....................... 1 2 3 4 5 6 7 8 9 10
.... 1 2 3 4 5 6 7 8 9 10
AL ALUMINUM....................... 1 2 3 4 5 6 7 8 9 10
CO COBALT......................... 1 2 3 4 5 6 7 8 9 10
FE IRON........................... 1 2 3 4 5 6 7 8 9 10
LI LITHIUM........................ 1 2 3 4 5 6 7 8 9 10
MN MANGANESE...................... 1 2 3 4 5 6 7 8 9 10
MO MOLYBDENUM...................... 1 2 3 4 5 6 7 8 9 10
TI TITANIUM....................... 1 2 3 4 5 6 7 8 9 10
V VANADIUM........................ 1 2 3 4 5 6 7 8 9 10
.... 1 2 3 4 5 6 7 8 9 10
.... 1 2 3 4 5 6 7 8 9 10
.... 1 2 3 4 5 6 7 8 9 10

GENERAL CHEMISTRY

COD............................... 1 2 3 4 5 6 7 8 9 10
KJELDAHL NITROGEN, TOTAL PHOS..... 1 2 3 4 5 6 7 8 9 10
PHENOLICS......................... 1 2 3 4 5 6 7 8 9 10
TOTAL CYANIDE..................... 1 2 3 4 5 6 7 8 9 10
TOTAL SOLIDS...................... 1 2 3 4 5 6 7 8 9 10
.... 1 2 3 4 5 6 7 8 9 10

.... 1 2 3 4 5 6 7 8 9 10
.... 1 2 3 4 5 6 7 8 9 10
.... 1 2 3 4 5 6 7 8 9 10
.... 1 2 3 4 5 6 7 8 9 10

MICH DNR ENVIRONMENTAL LAB
ORGANIC RESULTS FOR LAB LOG #74[illegible]

LAB# 54697 REC# 4534	ug/Kg ppb	SCAN 1	COMMENT
	700.00	TRICHLOROETHENE	MM
N SIDE	11.00	Detection limit	

LAB# 5469[illegible] REC# 4600	ug/Kg ppb	SCAN 1	COMMENTS
	29000.00	TRICHLOROETHENE	DR MM
S SIDE	720.00	Detection limit	

Unless noted above under COMMENTS, analyses were performed for the compounds on attached scan list. Concentrations are rounded to 2 significant figures.

Approved [signature]

DEC 2 [illegible]

SCAN 3 - Chlorinated Hydrocarbons, PCBs & Organochlorine [illegible]

Aldrin
*Aroclor 1016
*Aroclor 1221
*Aroclor 1232
Aroclor 1242
*Aroclor 1248
Aroclor 1254
Aroclor 1260
*Aroclor 1262
*Aroclor 1268
g-BHC (lindane)
BP-6 (PBB)
a-Chlordane
g-Chlordane
2-Chloronaphthalene
4,4'-DDD
4,4'-DDE
1,4'-DDT
4,4'-DDT
1,2-Dichlorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
Heptachlor
Heptachlor epoxide
Hexabromobenzene
Hexachlorobenzene
Hexachlorobutadiene
Hexachlorocyclopentadiene
Hexachloroethane
Methoxychlor
Mirex
Pentachloronitrobenzene
*Toxaphene
1,2,4-Trichlorobenzene

SCAN 6 - Phthalate Esters & Polar Pesticides

Bis (2-ethylhexyl) phthalate
Butyl benzyl phthalate
Di-n-butyl phthalate
Diethyl phthalate
Dimethyl phthalate
Di-n-octyl phthalate
Dieldrin
Endosulfan I
Endrin

Appendix B Construction Records for Soil Borings

Appendix B Construction Records for Soil Borings
Appendix B Construction Records for Soil Borings
Appendix B Construction Records for Soil Borings
Appendix B Construction Records for Soil Borings
Appendix B Construction Records for Soil Borings
Appendix B Construction Records for Soil Borings
Appendix B Construction Records for Soil Borings
Appendix B Construction Records for Soil Borings
Appendix B Construction Records for Soil Borings
Appendix B Construction Records for Soil Borings
Appendix B Construction Records for Soil Borings
Appendix B Construction Records for Soil Borings
Appendix B Construction Records for Soil Borings
Appendix B Construction Records for Soil Borings
Appendix B Construction Records for Soil Borings

MICHIGAN TESTING ENGINEERS, INC.
CONSULTING ENGINEERS IN SOILS & FOUNDATIONS

LOG OF SOIL BORING NO. TB-1

JOB NO. 406-45055

PROJECT Gold Shield Solvents

LOCATION 312 Elsworth Street
Grand Rapids, Michigan

SURFACE ELEV. -- DATE 7-3-84

Sample & Type	Depth	Legend	SOIL DESCRIPTION	Penetration Blows For 6"	Moisture %	Natural Wt. P.C.F.	Dry Den Wt. P.C.F.	Unc. Comp. Strength PSF.	Str. %
		0'6"	CONCRETE						
	1	1'0"	GRAVEL, coarse to fine, brown (FILL)						
			FILL, black silty clay and cinders						
	2	2'0"		9					
A			FILL, brown silty clay and brown coarse to fine sand and cinders	8	-	-	-	-	-
SS	3			6					
	4								
				2					
B	5			2	16.7	-	-	-	-
SS		5'6"		1					
	6		FILL, dark brown silty clay, occasional gravel, wood, coal						
	7			1					
C				1	17.9	113.8	96.5	-	-
SS	8	8'0"		1					
	9		Silty CLAY, some fine sand, brown						
				3					
D	10			3	15.5	122.5	106.1	3480	20.0
SS				5					
	11								
	12	12'6"							
	13		Fine SAND, brown						
	14								
				3					
E	15			3	11.7	-	-	-	-
SS				4					
	16								
	17	17'0"							
	18		Coarse to fine SAND and GRAVEL, brown, trace clayey silt, occasional cobble						
	19								
				5					
F	20			9	-	-	-	-	-
SS				5					
	21								
	22	22'0"							
	23		Layers brown silty CLAY and brown, coarse to fine sand, moist						
	24								
				9					
G	25			9	-	-	-	-	-
SS		25'6"	End of Boring	9					

TYPE OF SAMPLE
D - DISTURBED
U L - UNDIST LINER
S T - SHELBY TUBE
S S - SPLIT SPOON
R C - ROCK CORE

REMARKS:

Standard Penetration Test — Driving 2" OD Sampler 1' With

GROUND WATER OBSERVATIONS

G W ENCOUNTERED AT FT INS
G W ENCOUNTERED AT FT INS
G W AFTER COMPLETION FT INS
G W AFTER HRS FT INS
None

MICHIGAN TESTING ENGINEERS, INC.
CONSULTING ENGINEERS IN SOILS & FOUNDATIONS

LOG OF SOIL BORING NO. TB-2

JOB NO. 406-45055

PROJECT Gold Shield Solvents

LOCATION 312 Elsworth Street
Grand Rapids, Michigan

SURFACE ELEV. -- DATE 7-3-84

Sample & Type	Depth	Legend	Soil Description	Penetration Blows For 6"	Moisture %	Natural Wt. P.C.F.	Dry Den Wt. P.C.F.	Unc. Comp. Strength PSF	Str. %
		0'6"	CONCRETE						
	1	1'1"	Fine SAND, brown						
	2		Silty CLAY and fine SAND, brown	2					
A				3	14.7	116.1	101.2	-	-
SS	3			3					
	4								
				2					
B	5			2	15.3	-	-	-	-
SS		5'5"		3					
	6		Brown silty CLAY, little fine sand, occasional fine gravel						
	7			4					
C				5	13.2	123.6	109.2	4050	20.0
SS	8			7					
	9								
				4					
D	10			8	-	-	-	-	-
SS				9					
	11								
	12								
	13								
	14	14'0"							
			Fine SAND, brown	9					
E	15			11	11.2	-	-	-	-
SS				13					
	16								
	17	17'0"							
	18		Coarse to fine SAND and GRAVEL, brown, occasional cobble						
	19								
				12					
F	20			10	12.9	-	-	-	-
SS				14					
	21								
	22								
	23								
	24								
				5					
G	25			5	-	-	-	-	-
SS		25'6"	End of Boring	7					

TYPE OF SAMPLE
D - DISTURBED
U.L. - UNDIST. LINER
S.T. - SHELBY TUBE
S.S. - SPLIT SPOON
R.C. - ROCK CORE
P - PENETROMETER

REMARKS:

Standard Penetration Test — Driving 2" OD Sampler 1' With [illegible]

GROUND WATER OBSERVATIONS
G.W. ENCOUNTERED AT FT. INS.
G.W. ENCOUNTERED AT FT. INS.
G.W. AFTER COMPLETION FT. INS.
G.W. AFTER HRS. FT. INS.
[illegible] None

EDI Engineering & Science
Environmental Engineering
Geology, Biology and Chemistry

Page: ____ of ____ 028
Well/Boring No.: Control Boring
Client: Gold Shield
Project No.: 205 10
Permit No.:
Date Started 4/23 Finished 4/23/86

Well / Boring Log Sheet

County	Township	Fraction	Section	T	R
KENT	CITY OF GRAND RAPIDS	1/4 1/4 SE 1/4	25	7N	12W

Contractor: Stearns Drilling
Address: Dutton, MI

Equipment: CME 45B

Supervisor: E Culver/J Venn

Drilling Method(s) / **Depth**
8" Hollow Stem Auger & Split Spoons — 0-13.0'

Grouting/Seal

Depth	To	Material
0	13.0'	Cement & Bentonite Slurry

Development: N/A

Water Level: ____ Ft. Below: ____
Measured On: DRY HOLE

Screen: N/A
Manufacturer:
Material:
Model:
Slot/Gauze: ____ Dia.:
Length:
Depth Set: ____ To:

Casing

Dia.	Type	Depth Set
	N/A	To
		To

Elevation
Casing:
Ground: 94.67'
Ref. Pt.:

Location Sketch: SEE LOCATION MAP

Remarks (include here, other data available)
Brass liner samples recovered for the measurement of permeability for the following sample intervals: 7.25-7.5'; 8.5-8.75'; 8.75-9.0'; and 9.0-10.0'. Evaluation datum at 100' established at the center of the overhead door on the plant floor.

(FEET) Thickness	(FEET) Depth To Base	Description	Remarks: SAMPLE DEPTHS (FEET)
1.5	1.5	CINDER ZONE - black	1.0 - 1.5
1.5	3.0	CLAY - tan, hard	1.5 - 2.0
3.5	6.5	SAND - fine to medium grained, dark brown	2.0 - 3.0
0.5	7.0	CLAY - gray, soft	3.0 - 3.5
0.3	7.3	SAND - fine to medium grained, dark brown	4.0 - 5.0
5.5	12.8	CLAY - silty, gray, soft (mottled brown to gray)	6.0 - 6.5
0.2	13.0	SAND - clayey to silty, fine grained, gray (wet)	6.5 - 7.0
			7.25 - 7.5
			8.5 - 8.75
			8.75 - 9.0
			9.0 - 10.0
			10.0 - 11.0
			11.0 - 12.0
			12.0 - 12.5
			12.8 - 13.0

EDI Engineering & Science
Environmental Engineering
Geology, Biology and Chemistry

Well / Boring Log Sheet

Page: ____ of ____ 028
Well/Boring No.: B-1
Client: Gold Shield
Project No.: 20510
Permit No.:
Date Started 4/25 Finished 4/25/86

County	Township	Fraction	Section	T	R
KENT	CITY OF GRAND RAPIDS	¼ ¼ SE ¼	25	7N	12W

Contractor: Stearns Drilling
Address: Dutton, MI

Equipment: CME 45B

Supervisor: E Culver/J Venn

Drilling Method(s) — **Depth**
8" Hollow Stem Auger & Split Spoons — 0-7.0'

Grouting/Seal

Depth	To	Material
0	7.0'	Cement & Bentonite Slurry

Development: N/A

Water Level: ____ Ft. Below: ____
Measured On: DRY HOLE

Screen: N/A
Manufacturer:
Material:
Model:
Slot/Gauze: ____ Dia.:
Length:
Depth Set: ____ To:

Casing

Dia.	Type	Depth Set
	N/A	To
		To

Elevation
Casing:
Ground: 96.00'
Ref. Pt.:

Remarks (include here, other data available)

Location Sketch: SEE LOCATION MAP

(FEET) Thickness	(FEET) Depth To Base	Description	Remarks: SAMPLE DEPTHS (FEET)
0.6	0.6	TOPSOIL - black (organic)	0.0 - 2.0
2.9	3.5	CLAY - black to yellow-brown, soft	2.0 - 4.0
0.5	4.0	GRAVEL WITH BLACK CINDERS	4.0 - 6.0
2.3	6.3	CINDER ZONE - black (minor clay)	6.0 - 7.0
0.7	7.0	CLAY - sandy, yellow-brown, soft	

EDI Engineering & Science
Environmental Engineering
Geology, Biology and Chemistry

Page:____of____ 028

Well/Boring No.: B-2
Client: Gold Shield
Project No.: 20510
Permit No.:
Date Started 4/25 Finished 4/25/86

Well / Boring Log Sheet

County	Township	Fraction	Section	T	R
KENT	CITY OF GRAND RAPIDS	1/4 1/4 SE 1/4	25	7N	12W

Contractor: Stearns Drilling
Address: Dutton, MI

Equipment: CME 45B

Supervisor: E Culver/J Venn

Drilling Method(s) **Depth**
8" Hollow Stem Auger & Split Spoons 0-6.0'

Grouting/Seal

Depth	To	Material
0	6.0'	Cement & Bentonite Slurry

Development: N/A

Water Level: ____ Ft. Below: ____
Measured On: DRY HOLE

Screen: N/A
Manufacturer:
Material:
Model:
Slot/Gauze: Dia.:
Length:
Depth Set: To:

Casing

Dia.	Type	Depth Set
	N/A	To
		To

Elevation
Casing:
Ground: 96.08'
Ref. Pt.:

Remarks (include here, other data available)

Location Sketch: SEE LOCATION MAP

(FEET) Thickness	(FEET) Depth To Base	Description	Remarks: SAMPLE DEPTHS (FEET)
0.8	0.8	TOPSOIL - black (organic)	0.0 - 2.0
2.4	3.2	CINDER ZONE - black	2.0 - 4.0
1.4	4.6	SAND - medium to coarse grained, gray-brown	4.0 - 6.0
1.4	6.0	CLAY - mottled tan to gray, soft	

EDI Engineering & Science
Environmental Engineering
Geology, Biology and Chemistry

Page: ____ of ____ 028

Well/Boring No.: B-3
Client: Gold Shield
Project No.: 205 10
Permit No.:
Date Started 4/25 Finished 4/25/86

Well / Boring Log Sheet

County	Township	Fraction	Section	T	R
KENT	CITY OF GRAND RAPIDS	1/4 1/4 SE 1/4	25	7N	12W

Contractor: Stearns Drilling
Address: Dutton, MI

Equipment: CME 45B

Supervisor: E Culver/J Venn

Drilling Method(s) — **Depth**
8" Hollow Stem Auger & Split Spoons — 0-6.0'

Grouting/Seal

Depth	To	Material
0	6.0'	Cement & Bentonite Slurry

Development: N/A

Water Level: ____ Ft. Below: ____
Measured On: DRY HOLE

Screen: N/A
Manufacturer:
Material:
Model:
Slot/Gauze: ____ Dia.:
Length:
Depth Set: ____ To:

Casing

Dia.	Type	Depth Set
	N/A	To
		To

Elevation
Casing:
Ground: 95.17'
Ref. Pt.:

Remarks (include here, other data available)

Location Sketch: SEE LOCATION MAP

(FEET) Thickness	(FEET) Depth To Base	Description	Remarks / SAMPLE DEPTHS (FEET)
0.6	0.6	TOPSOIL - black (organic)	0.0 - 2.0
0.8	1.4	CINDER ZONE - black	2.0 - 4.0
0.6	2.0	SAND - gravelly and clayey, dark brown	4.0 - 6.0
0.8	2.8	CINDER ZONE - black	
1.2	4.0	SAND - medium grained, orange-brown	
0.5	4.5	CLAY - sandy, yellow-gray, soft	
1.5	6.0	CLAY - gray to tan, soft	

EDI Engineering & Science
Environmental Engineering
Geology, Biology and Chemistry

Page: ____ of ____ 028

Well/Boring No.: B-4

Client: Gold Shield

Project No.: 20510

Permit No.:

Date Started 4/25 Finished 4/25/86

Well / Boring Log Sheet

County	Township	Fraction	Section	T	R
KENT	CITY OF GRAND RAPIDS	1/4 1/4 SE 1/4	25	7N	12W

Contractor: Stearns Drilling
Address: Dutton, MI

Equipment: CME 45B

Supervisor: E Culver/J Venn

Drilling Method(s) **Depth**
8" Hollow Stem Auger & Split Spoons 0-6.0'

Grouting/Seal
Depth 0 To 6.0' Material Cement & Bentonite Slurry

Development: N/A

Water Level: ____ Ft. Below: ____
Measured On: DRY HOLE

Screen: N/A
Manufacturer:
Material:
Model:
Slot/Gauze: ____ Dia.:
Length:
Depth Set: ____ To:

Casing
Dia. ____ Type N/A Depth Set ____ To ____

Elevation
Casing:
Ground: 95.27'
Ref. Pt.:

Remarks (include here, other data available)

Location Sketch: SEE LOCATION MAP

(FEET) Thickness	(FEET) Depth To Base	Description	Remarks SAMPLE DEPTHS (FEET)
0.1	0.1	TOPSOIL - (gravel)	0.0 - 2.0
1.4	1.5	CINDER ZONE - black	2.0 - 4.0
2.0	3.5	CLAY - black, cinderly (contains wood)	4.0 - 6.0
2.1	5.6	SAND - medium grained, light brown	
0.4	6.0	CLAY - sandy, tan (soft)	

EDI Engineering & Science
Environmental Engineering
Geology, Biology and Chemistry

Page: ___ of ___ 028

Well/Boring No.: B-5

Client: Gold Shield

Project No.: 205 10

Permit No.:

Date Started 4/25 Finished 4/25/86

Well / Boring Log Sheet

County	Township	Fraction	Section	T	R
KENT	CITY OF GRAND RAPIDS	1/4 1/4 SE 1/4	25	7N	12W

Contractor: Stearns Drilling
Address: Dutton, MI

Equipment: CME 45B

Supervisor: E Culver/J Venn

Drilling Method(s) **Depth**
8" Hollow Stem Auger & Split Spoons 0.-6.0'

Grouting/Seal

Depth	To	Material
0	6.0'	Cement & Bentonite Slurry

Development: N/A

Water Level: ___ Ft. Below: ___
Measured On: DRY HOLE

Screen: N/A
Manufacturer:
Material:
Model:
Slot/Gauze: ___ Dia.:
Length:
Depth Set ___ To:

Casing

Dia.	Type	Depth Set
	N/A	To
		To

Elevation
Casing:
Ground: 95.67'
Ref. Pt.:

Remarks (include here, other data available)

Location Sketch: SEE LOCATION MAP

(FEET) Thickness	(FEET) Depth To Base	Description	Remarks: SAMPLE DEPTHS (FEET)
0.3	0.3	TOPSOIL - (gravel)	0.0 - 2.0
1.4	1.7	CINDER ZONE - black	2.0 - 4.0
0.8	2.5	CLAY - yellow-brown, soft	4.0 - 6.0
1,0	3.5	CLAY - dark gray to black, soft	
0.9	4.4	CLAY - dark brown (large stones)	
1.4	5.8	CINDER ZONE - black	
0.2	6.0	CLAY - yellow-gray, soft	

EDI Engineering & Science
Environmental Engineering
Geology, Ecology and Chemistry

Page: ___ of ___ 028
Well/Boring No.: B-6
Client: Gold Shield
Project No.: 20510
Permit No.:
Date Started 4/25 Finished 4/25/86

Well / Boring Log Sheet

County	Township	Fraction	Section	T	R
KENT	CITY OF GRAND RAPIDS	1/4 1/4 SE 1/4	25	7N	12W

Contractor: Stearns Drilling
Address: Dutton, MI

Equipment: CME 45B

Supervisor: E Culver/J Venn

Drilling Method(s) / **Depth**
8" Hollow Stem Auger & Split Spoons — 0-7.0'

Grouting/Seal

Depth	To	Material
0	7.0'	Cement & Bentonite Slurry

Development: N/A

Water Level: ___ Ft. Below: ___
Measured On: DRY HOLE

Screen: N/A
Manufacturer:
Material:
Model:
Slot/Gauze: ___ Dia.:
Length:
Depth Set: ___ To:

Casing

Dia.	Type	Depth Set
	N/A	To
		To

Elevation
Casing:
Ground: 95.66'
Ref. Pt.:

Remarks (include here, other data available)

Location Sketch: SEE LOCATION MAP

(FEET) Thickness	(FEET) Depth To Base	Description	Remarks: SAMPLE DEPTHS (FEET)
0.6	0.6	TOPSOIL - black	0.0 - 2.0
0.6	1.2	CLAY - orange-brown	2.0 - 4.0
0.8	2.0	CLAY - black, cindery	4.0 - 6.0
2.5	4.5	SAND - gravelly and clayey, dark brown	6.0 - 7.0
1.5	6.0	CLAY - yellow-brown, stiff	
1.0	7.0	CLAY - dark gray to black, cindery, soft	

EDI Engineering & Science
Environmental Engineering
Geology, Biology and Chemistry

Page:____of____ 028

Well/Boring No.: B-7
Client: Gold Shield
Project No.: 205.10
Permit No.:
Date Started 4/24 Finished 4/24/86

Well / Boring Log Sheet

County	Township	Fraction	Section	T	R
KENT	CITY OF GRAND RAPIDS	¼ ¼ SE ¼	25	7N	12W

Contractor: Stearns Drilling
Address: Dutton, MI

Equipment: CME 45B

Supervisor: E Culver/J Venn

Drilling Method(s) **Depth**
8" Hollow Stem Auger & Split Spoons 0-7.5'

Grouting/Seal

Depth	To	Material
0	7.5'	Cement & Bentonite Slurry

Development: N/A

Water Level:____ Ft. Below:____
Measured On: DRY HOLE

Screen: N/A
Manufacturer:
Material:
Model:
Slot/Gauze:____ Dia.:
Length:
Depth Set____ To:

Casing

Dia.	Type	Depth Set
	N/A	To
		To

Elevation
Casing:
Ground: 95.61'
Ref. Pt.:

Remarks (include here, other data available)

Location Sketch: SEE LOCATION MAP

(FEET) Thickness	(FEET) Depth To Base	Description	Remarks: SAMPLE DEPTHS (FEET)
0.4	0.4	TOPSOIL - brown	0.0 - 2.0
0.6	1.0	CINDER ZONE - black	3.0 - 5.0
0.8	1.8	CLAY - yellow-brown, stiff	6.0 - 7.0
1.2	3.0	SAND - coarse grained, dark brown	7.0 - 7.5
4.2	7.2	CLAY - yellow-brown, stiff	
0.3	7.5	CLAY - dark gray, soft, cindery	

EDI Engineering & Science
Environmental Engineering
Geology, Biology and Chemistry

Page: ___ of ___ 028

Well/Boring No.: 8-8

Client: Gold Shield

Project No.: 20510

Permit No.:

Date Started 4/24 Finished 4/24/86

Well / Boring Log Sheet

County	Township	Fraction	Section	T	R
KENT	CITY OF GRAND RAPIDS	1/4 1/4 SE 1/4	25	7N	12W

Contractor: Stearns Drilling
Address: Dutton, MI

Equipment: CME 45B

Supervisor: E Culver/J Venn

Drilling Method(s) — **Depth**
8" Hollow Stem Auger & Split Spoons — 0-7.5'

Grouting/Seal

Depth	To	Material
0	7.5'	Cement & Bentonite Slurry

Development: N/A

Water Level: ___ Ft. Below: ___
Measured On: DRY HOLE

Screen: N/A
Manufacturer:
Material:
Model:
Slot/Gauze: Dia.:
Length:
Depth Set: To:

Casing

Dia.	Type	Depth Set
	N/A	To

Elevation
Casing:
Ground: 94.77'
Ref. Pt.:

Remarks (include here, other data available)

Location Sketch: SEE LOCATION MAP

Thickness (FEET)	Depth To Base (FEET)	Description	Remarks: SAMPLE DEPTHS (FEET)
0.4	0.4	TOPSOIL	0.0 - 2.0
3.1	3.5	CLAY - yellow-brown to brown (some black cinders)	2.0 - 4.0
0.5	4.0	CINDER ZONE - black	4.0 - 6.0
1.5	5.5	CLAY - tan to gray	7.0 - 7.5
1.7	7.2	SAND - coarse grained, dark gray (cinders)	
0.3	7.5	CLAY - dark gray to black, soft	

EDI Engineering & Science
Environmental Engineering
Geology, Biology and Chemistry

Page: ____ of ____ 028

Well/Boring No.: B-9
Client: Gold Shield
Project No.: 20510
Permit No.:
Date Started 4/24 Finished 4/24/86

Well / Boring Log Sheet

County	Township	Fraction	Section	T	R
KENT	CITY OF GRAND RAPIDS	¼ ¼ SE ¼	25	7N	12W

Contractor: Stearns Drilling
Address: Dutton, MI

Equipment: CME 45B

Supervisor: E Culver/J Venn

Drilling Method(s) — **Depth**
8" Hollow Stem Auger & Split Spoons — 0-9.0'

Grouting/Seal

Depth	To	Material
0	9.0'	Cement & Bentonite Slurry

Development: N/A

Water Level: ____ Ft. Below: ____
Measured On: DRY HOLE

Screen: N/A
Manufacturer:
Material:
Model:
Slot/Gauze: ____ Dia.:
Length:
Depth Set ____ To:

Casing

Dia.	Type	Depth Set
	N/A	To
		To

Elevation
Casing:
Ground: 95.26'
Ref. Pt.:

Location Sketch: SEE LOCATION MAP

Remarks (include here, other data available)

Sewer manhole 9' northwest of B-9 and sewer line may have altered natural soils during construction. There is no well-defined clay below 5.7'.

(FEET) Thickness	(FEET) Depth To Base	Description	Remarks SAMPLE DEPTHS (FEET)
0.4	0.4	TOPSOIL - (sand and gravel)	0.0 - 2.0
1.1	1.5	CINDER ZONE - black	2.0 - 4.0
0.4	1.9	CLAY - yellow-brown, stiff	4.0 - 6.0
0.1	2.0	SAND - coarse grained, yellow-brown	6.0 - 7.0
2.5	4.5	SAND - gravelly and clayey, dark brown	7.0 - 8.0
1.2	5.7	CLAY - yellow-brown to brown, stiff	
2.1	7.8	SAND - coarse grained, yellow-brown	
0.2	8.0	CLAY - sandy, dark gray	
1.0	9.0	GRAVEL - clayey, dark gray, wet	
		NOTE: No sample recovery from 8.0' to 9.0'	

EDI Engineering & Science
Environmental Engineering
Geology, Biology and Chemistry

Page: ____ of ____ B-10 028
Well/Boring No.:
Client: Gold Shield
Project No.: 205 10
Permit No.:
Date Started 4/24 Finished 4/24/86

Well / Boring Log Sheet

County	Township	Fraction	Section	T	R
KENT	CITY OF GRAND RAPIDS	1/4 1/4 SE 1/4	25	7N	12W

Contractor: Stearns Drilling
Address: Dutton, MI

Equipment: CME 45B

Supervisor: E Culver/J Venn

Drilling Method(s) 8" Hollow Stem Auger & Split Spoons **Depth** 0-7.0'

Grouting/Seal

Depth	To	Material
0	7.0'	Cement & Bentonite Slurry

Development: N/A

Water Level: ____ Ft. Below: ____
Measured On: DRY HOLE

Screen: N/A
Manufacturer:
Material:
Model:
Slot/Gauze: ____ Dia.:
Length:
Depth Set ____ To:

Casing

Dia.	Type	Depth Set
	N/A	To
		To

Elevation
Casing:
Ground: 94.93'
Ref. Pt.:

Remarks (include here, other data available)

Location Sketch: SEE LOCATION MAP

(FEET) Thickness	(FEET) Depth To Base	Description	Remarks SAMPLE DEPTHS (FEET)
0.8	0.8	TOPSOIL - (sand and gravel)	0.0 - 2.0
2.2	3.0	CLAY - dark brown, cindery (orange in spots)	2.0 - 4.0
2.6	5.6	SAND - fine to medium grained, dark brown	4.0 - 6.0
0.9	6.5	CLAY - mottled tan to gray, soft	6.0 - 7.0
0.5	7.0	CLAY - tan to light gray, hard (contains some fine sand)	

EDI Engineering & Science
Environmental Engineering
Geology, Biology and Chemistry

Page: ____ of ____ 028

Well/Boring No.: B-11
Client: Gold Shield
Project No.: 20510
Permit No.:
Date Started 4/24 Finished 4/24/86

Well / Boring Log Sheet

County	Township	Fraction	Section	T	R
KENT	CITY OF GRAND RAPIDS	1/4 1/4 SE 1/4	25	7N	12W

Contractor: Stearns Drilling
Address: Dutton, MI

Equipment: CME 45B

Supervisor: E Culver/J Venn

Drilling Method(s) **Depth**
8" Hollow Stem Auger & Split Spoons 0-7.5'

Grouting/Seal

Depth	To	Material
0	7.5'	Cement & Bentonite Slurry

Development: N/A

Water Level: ____ Ft. Below: ____
Measured On: DRY HOLE

Screen: N/A
Manufacturer:
Material:
Model:
Slot/Gauze: ____ Dia.:
Length:
Depth Set ____ To:

Casing

Dia.	Type	Depth Set
	N/A	To
		To

Elevation
Casing:
Ground: 94.61'
Ref. Pt.:

Remarks (include here, other data available)

Location Sketch: SEE LOCATION MAP

(FEET) Thickness	(FEET) Depth To Base	Description	Remarks SAMPLE DEPTHS (FEET)
3.0	3.0	CINDER ZONE - black (brown to black soil at surface)	0.0 - 2.0
1.2	4.2	SAND - fine to medium grained, dark brown (slight clay)	2.0 - 4.0
2.5	6.7	CLAY - yellow-brown to orange-brown, soft	4.0 - 6.0
0.4	7.1	CINDER ZONE - black	6.0 - 7.0
0.4	7.5	CLAY - dark gray to black, some black cinders, soft	7.0 - 7.5

Geology, Energy and Chemistry

Page:____of____ 028

Well/Boring No.: B-12

Client: Gold Shield

Project No.: 20910

Permit No.:

Date Started 4/24 Finished 4/24/86

Well / Boring Log Sheet

County	Township	Fraction	Section	T	R
KENT	CITY OF GRAND RAPIDS	¼ ¼ SE ¼	25	7N	12W

Contractor: Stearns Drilling

Address: Dutton, MI

Equipment: CME 45B

Supervisor: E Culver/J Venn

Drilling Method(s): 8" Hollow Stem Auger & Split Spoons — Depth: 0-8.5'

Grouting/Seal

Depth	To	Material
0	8.5'	Cement & Bentonite Slurry

Development: N/A

Water Level: ____ Ft. Below: ____

Measured On: DRY HOLE

Screen: N/A

Manufacturer:

Material:

Model:

Slot/Gauze: ____ Dia.:

Length:

Depth Set: ____ To:

Casing

Dia.	Type	Depth Set
	N/A	To
		To

Elevation

Casing:

Ground: 94.63'

Ref. Pt.:

Remarks (include here, other data available)

Location Sketch: SEE LOCATION MAP

(FEET) Thickness	(FEET) Depth To Base	Description	Remarks: SAMPLE DEPTHS (FEET)
1.5	1.5	CINDER ZONE - black	0.5 - 2.0
4.0	5.5	CLAY - dark yellow-brown, stiff (contains stones)	2.0 - 4.0
1.0	6.5	SAND - medium to coarse grained, dark brown	5.0 - 6.0
1.3	7.8	CINDER ZONE - black (minor sand and clay)	6.5 - 7.5
0.7	8.5	CLAY - gray to black, soft	7.5 - 8.0
			8.0 - 8.5

EDI Engineering & Science
Environmental Engineering
Geology, Biology and Chemistry

Page:____of____ 028
Well/Boring No.: B-13
Client: Gold Shield
Project No.: 20510
Permit No.:
Date Started 4/24 Finished 4/24/86

Well / Boring Log Sheet

County	Township	Fraction	Section	T	R
KENT	CITY OF GRAND RAPIDS	1/4 1/4 SE 1/4	25	7N	12W

Contractor: Stearns Drilling
Address: Dutton, MI

Equipment: CME 45B

Supervisor: E Culver/J Venn

Drilling Method(s) **Depth**
8" Hollow Stem Auger & Split Spoons 0-7.0'

Grouting/Seal

Depth	To	Material
0	7.0'	Cement & Bentonite Slurry

Development: N/A

Water Level: ____ Ft. Below: ____
Measured On: DRY HOLE

Screen: N/A
Manufacturer:
Material:
Model:
Slot/Gauze: Dia.:
Length:
Depth Set: To:

Casing

Dia.	Type	Depth Set
	N/A	To
		To

Elevation
Casing:
Ground: 94.67'
Ref. Pt.:

Remarks (include here, other data available)

Location Sketch: SEE LOCATION MAP

(FEET) Thickness	(FEET) Depth To Base	Description	Remarks SAMPLE DEPTHS (FEET)
1.0	1.0	SAND - clayey, brown to dark brown	0.0 - 2.0
1.3	2.3	CINDER ZONE - black	2.0 - 4.0
1.9	4.2	SAND - fine to medium grained, dark brown	4.0 - 6.0
1.6	5.8	SAND - clayey to gravelly, dark brown	6.0 - 7.0
0.2	6.0	CLAY - yellow-brown, soft	
0.6	6.6	SAND - medium to coarse grained, dark brown	
0.4	7.0	CLAY - gray, soft	

EDI Engineering & Science
Environmental Engineering
Geology, Biology and Chemistry

Page: ___ of ___ 028

Well/Boring No.: B-14
Client: Gold Shield
Project No.: 20510
Permit No.:
Date Started 4/24 Finished 4/24/86

Well / Boring Log Sheet

County	Township	Fraction	Section	T	R
KENT	CITY OF GRAND RAPIDS	1/4 1/4 SE 1/4	25	7N	12W

Contractor: Stearns Drilling
Address: Dutton, MI

Equipment: CME 45B

Supervisor: E Culver/J Venn

Drilling Method(s) **Depth**
8" Hollow Stem Auger & Split Spoons 0-6.5'

Grouting/Seal

Depth	To	Material
0	6.5'	Cement & Bentonite Slurry

Development: N/A

Water Level: ___ Ft. Below: ___
Measured On: DRY HOLE

Screen: N/A
Manufacturer:
Material:
Model:
Slot/Gauze: Dia.:
Length:
Depth Set: To:

Casing

Dia.	Type	Depth Set
	N/A	To
		To

Elevation
Casing:
Ground: 94.60'
Ref. Pt.:

Remarks (include here, other data available)

Location Sketch: SEE LOCATION MAP

(FEET) Thickness	(FEET) Depth To Base	Description	Remarks: SAMPLE DEPTHS (FEET)
0.5	0.5	TOPSOIL - brown to black (contains sand and clay)	0.0 - 2.0
1.5	2.0	CINDER ZONE - black	2.0 - 4.0
2.2	4.2	SAND - fine to medium grained, dark brown	4.0 - 6.0
2.3	6.5	CLAY - gray, soft	6.0 - 6.5

EDI Engineering & Science
Environmental Engineering
Geology, Biology and Chemistry

Page:____of____ 028
Well/Boring No.: B-15
Client: Gold Shield
Project No.: 20510
Permit No.:
Date Started 4/25 Finished 4/25/86

Well / Boring Log Sheet

County	Township	Fraction	Section	T	R
KENT	CITY OF GRAND RAPIDS	¼ ¼ SE ¼	25	7N	12W

Contractor: Stearns Drilling
Address: Dutton, MI
Equipment: CME 45B
Supervisor: E Culver/J Venn
Drilling Method(s) **Depth**
8" Hollow Stem Auger & Split Spoons 0-6.0'
Grouting/Seal

Depth	To	Material
0	6.0'	Cement & Bentonite Slurry

Development: N/A
Water Level: ____ Ft. Below:
Measured On: DRY HOLE

Screen: N/A
Manufacturer:
Material:
Model:
Slot/Gauze: Dia.:
Length:
Depth Set: To:

Casing

Dia.	Type	Depth Set
	N/A	To
		To

Elevation
Casing:
Ground: 95.30'
Ref. Pt.:

Remarks (include here, other data available)

Location Sketch: SEE LOCATION MAP

(FEET) Thickness	(FEET) Depth To Base	Description	Remarks: SAMPLE DEPTHS (FEET)
0.4	0.4	TOPSOIL - black (organic)	0.0 - 2.0
0.9	1.3	CINDER ZONE - black	2.0 - 4.0
0.3	1.6	CLAY - sandy, brown (soft)	4.0 - 6.0
0.4	2.0	CLAY - dark gray, soft	
0.5	2.5	SAND - fine to medium grained (orange)	
1.3	3.8	CLAY - dark brown, soft	
0.4	4.2	CINDER ZONE - black	
1.8	6.0	CLAY - mottled tan to gray, soft	

EDI Engineering & Science
Environmental Engineering
Geology, Biology and Chemistry

Page:____of____ 028
Well/Boring No.: 8-16
Client: Gold Shield
Project No.: 20510
Permit No.:
Date Started 4/24 Finished 4/24/86

Well / Boring Log Sheet

County	Township	Fraction	Section	T	R
KENT	CITY OF GRAND RAPIDS	1/4 1/4 SE 1/4	25	7N	12W

Contractor: Stearns Drilling
Address: Dutton, MI

Equipment: CME 45B

Supervisor: E Culver/J Venn

Drilling Method(s) **Depth**
8" Hollow Stem 0-6.0'
Auger & Split
Spoons

Grouting/Seal

Depth	To	Material
0	6.0'	Cement & Bentonite Slurry

Development: N/A

Water Level: ____ Ft. Below: ____
Measured On: DRY HOLE

Screen: N/A
Manufacturer:
Material:
Model:
Slot/Gauze: ____ Dia.:
Length:
Depth Set: ____ To:

Casing

Dia.	Type	Depth Set
	N/A	To
		To

Elevation
Casing:
Ground: 94.39'
Ref. Pt.:

Remarks (include here, other data available)

Location Sketch: SEE LOCATION MAP

(FEET) Thickness	(FEET) Depth To Base	Description	Remarks SAMPLE DEPTHS (FEET)
0.5	0.5	TOPSOIL - brown	0.0 - 2.0
1.4	1.9	CINDER ZONE - black	2.0 - 4.0
2.1	4.0	SAND - medium to coarse grained, dark brown	4.0 - 6.0
2.0	6.0	CLAY - mottled tan to gray (grayer at bottom, soft	

Appendix C Permeability Data

Appendix C Permeability Data
Appendix C Permeability Data
Appendix C Permeability Data
Appendix C Permeability Data
Appendix C Permeability Data
Appendix C Permeability Data
Appendix C Permeability Data
Appendix C Permeability Data
Appendix C Permeability Data
Appendix C Permeability Data
Appendix C Permeability Data
Appendix C Permeability Data
Appendix C Permeability Data
Appendix C Permeability Data
Appendix C Permeability Data

EDI ENGINEERING & SCIENCE
ENGINEERS GEOLOGISTS BIOLOGISTS CHEMISTS

COEFFICIENT OF PERMEABILITY (Constant Head, Falling Head)

Project Gold Shield Job No. 20510

Location of Project

Description of Soil 7.25 – 7.5 (B)

Tested by CAROLINA Date of Testing

Sample Dimensions: Diam. 3.49 cm; (Brass sleeve (I.D) Area 9.58 cm²; (Brass sleeve)(I.D) Ht. 3.1 cm (of sample)

Wt. soil + pan Init. g

Vol. cm³

Wt.soil + pan Final g

Unit wt. kN/m³

Wt. of Sample g

Constant Head

Test data *Test data used*

Test No.	t, s	Q, cm³	T, °C	Test No.	t, s	Q, cm³	T, °C
1							
2							
3							
4							
				Average[a]			

$k_T = QL/Aht =$ ______ $\eta_T/\eta_{20} =$ ______

$=$ ______ cm/s $k_{20} = k_T\eta_T/\eta_{20} =$ ______ cm/s

Falling Head

Standpipe = [burette, other (specify)] burette

Area of standpipe, $a =$ .9698 cm²

Test data[b] *Test data used*

Test no.	h_1, cm	h_2, cm	t, s	Q_{in}, cm³	Q_{out}, cm³	T, °C	Test no.	h_1, cm	h_2, cm	t, s	T, °C
1	175.26	174.56	81,400	.7		20			1.44	x10	-8
2	175.26	174.26	81,400	1.0		20			2.06	x10	-8
3											
4											
							Average	K_T	1.75	x10	-8

$\eta_T/\eta_{20} =$ ______

$k_T = \frac{aL}{At} \ln h_1/h_2 =$ ______ $=$ ______ cm/sec

$k_{20} = k_T\eta_T/\eta_{20} =$ ______ $=$ ______ cm/sec

[a]Use averaged values only if there is a small difference in test temperature, say, 1–2°C.

[b]This test can be considerably simplified by using the same values of h_1 and h_2 each time, otherwise you cannot average these values regardless of T.

COEFFICIENT OF PERMEABILITY (Constant Head, Falling Head)

Project Gold Shield Job No. 20510

Location of Project

Description of Soil B @ 8.5 - 8.75

Tested by CAROLINA Date of Testing 5-2-86

Sample Dimensions: Diam. 3.49 cm; Area 9.58 cm²; Ht. 3.8 cm

Wt. soil + pan Init. ________ g

Vol. ________ cm³

Wt.soil + pan Final ________ g

Unit wt. ________ kN/m³

Wt. of Sample ________ g

Constant Head

Test data				*Test data used*			
Test No.	t, s	Q, cm³	T, °C	Test No.	t, s	Q, cm³	T, °C
1							
2							
3							
4							
				Average[a]			

$k_T = QL/Aht =$ ________

$=$ ________ cm/s

$\eta_T/\eta_{20} =$ ________

$k_{20} = k_T\eta_T/\eta_{20} =$ ________ cm/s

Falling Head

Standpipe = [burette, other (specify)] burette

Area of standpipe, a = .9698 cm²

Test data[b]							*Test data used*				
Test no.	h_1, cm	h_2, cm	t, s	Q_{in}, cm³	Q_{out}, cm³	T, °C	Test no.	h_1, cm	h_2, cm	t, s	T, °C
1	175.26	174.86	86400	.4		20°	1		1.00×10^{-8}		
2	175.26	174.66	86400	.6		20	2		1.51×10^{-8}		
3											
4											
							Average	KT	1.255×10^{-8}		

$\eta_T/\eta_{20} =$ 1.000

$k_T = \frac{aL}{At} \ln h_1/h_2 =$ ________ = ________ cm/sec

$k_{20} = k_T\eta_T/\eta_{20} =$ ________ = ________ cm/sec

[a]Use averaged values only if there is a small difference in test temperature, say, 1–2°C.

[b]This test can be considerably simplified by using the same values of h_1 and h_2 each time, otherwise you cannot average these values regardless of T.

COEFFICIENT OF PERMEABILITY (Constant Head, Falling Head)

Project Gold Shield Job No. 20510
Location of Project
Description of Soil B 8.75 - 9.0
Tested by CAROLINA Date of Testing
Sample Dimensions: Diam. 3.49 cm; Area 9.58 cm^2; Ht. 4.0 cm
Wt. soil + pan Init. ______ g
Wt. soil + pan Final ______ g
Wt. of Sample ______ g
Vol. ______ cm^3
Unit wt. ______ kN/m^3

Constant Head

Test data / *Test data used*

Test No.	t, s	Q, cm^3	T, °C	Test No.	t, s	Q, cm^3	T, °C
1							
2							
3							
4							
				Average[a]			

$k_T = QL/Aht =$ ______ $\eta_T/\eta_{20} =$ ______

$=$ ______ cm/s $k_{20} = k_T\eta_T/\eta_{20} =$ ______ cm/s

Falling Head

Standpipe = [burette, other (specify)] burette
Area of standpipe, $a =$ .9698 cm^2

Test data[b] / *Test data used*

Test no.	h_1, cm	h_2, cm	t, s	Q_{in}, cm^3	Q_{out}, cm^3	T, °C	Test no.	h_1, cm	h_2, cm	t, s	T, °C
1	175.26	174.86	86400	.4		20	1		1.07	×10	-8
2	175.26	174.66	86400	.16		20	2		1.61	×10	-8
3											
4											
							Average	KT	1.34	×	10^{-8}

$\eta_T/\eta_{20} =$ ______

$k_T = \frac{aL}{At} \ln h_1/h_2 =$ ______ $=$ ______ cm/sec

$k_{20} = k_T\eta_T/\eta_{20} =$ ______ $=$ ______ cm/sec

[a]Use averaged values only if there is a small difference in test temperature, say, 1–2°C.
[b]This test can be considerably simplified by using the same values of h_1 and h_2 each time, otherwise you cannot average these values regardless of T.

COEFFICIENT OF PERMEABILITY (Constant Head, Falling Head)

Project Gold Shield Job No. 20510

Location of Project

Description of Soil B 9-10

Tested by Date of Testing

Sample Dimensions: Diam. 3.49 cm; Area 9.58 cm^2; Ht. 3.5 cm

Wt. soil + pan Init. g

Wt. soil + pan Final g

Wt. of Sample g

Vol. cm^3

Unit wt. kN/m^3

Constant Head

Test data *Test data used*

Test No.	t, s	Q, cm^3	T, °C	Test No.	t, s	Q, cm^3	T, °C
1							
2							
3							
4							
				Average[a]			

$k_T = QL/Aht =$ ______ $\eta_T/\eta_{20} =$ ______

$=$ ______ cm/s $k_{20} = k_T\eta_T/\eta_{20} =$ ______ cm/s

Falling Head

Standpipe = [burette, other (specify)] burette

Area of standpipe, $a =$ .9698 cm^2

Test data[b] *Test data used*

Test no.	h_1, cm	h_2, cm	t, s	Q_{in}, cm^3	Q_{out}, cm^3	T, °C	Test no.	h_1, cm	h_2, cm	t, s	T, °C
1	175.26	174.26	86400	1.0		20			2.35×10^{-8}		
2	175.26	174.16	86400	1.1		20			2.58×10^{-8}		
3											
4											
							Average	KT	2.465×10^{-8}		

$\eta_T/\eta_{20} =$ ______

$k_T = \frac{aL}{At} \ln h_1/h_2 =$ ______ $=$ ______ cm/sec

$k_{20} = k_T\eta_T/\eta_{20} =$ ______ $=$ ______ cm/sec

[a]Use averaged values only if there is a small difference in test temperature, say, 1–2°C.

[b]This test can be considerably simplified by using the same values of h_1 and h_2 each time, otherwise you cannot average these values regardless of T.

Appendix D EDI Analytical Results for 1986
Appendix D EDI Analytical Results for 1986
Appendix D EDI Analytical Results for 1986
Appendix D EDI Analytical Results for 1986
Appendix D EDI Analytical Results for 1986
Appendix D EDI Analytical Results for 1986
Appendix D EDI Analytical Results for 1986
Appendix D EDI Analytical Results for 1986
Appendix D EDI Analytical Results for 1986
Appendix D EDI Analytical Results for 1986
Appendix D EDI Analytical Results for 1986
Appendix D EDI Analytical Results for 1986
Appendix D EDI Analytical Results for 1986
Appendix D EDI Analytical Results for 1986
Appendix D EDI Analytical Results for 1986
Appendix D EDI Analytical Results for 1986

ANALYTICAL SERVICES
EDI LABORATORY REPORT

CLIENT: GOLD SHIELD SOLVENTS
PROJECT NO.: 25690
LOCATION: GOLD SHIELD PLANT
SAMPLED BY: ELC & JLV
DESCRIPTION: SOIL QUALITY INVESTIGATION

DATE SAMPLED: 00/00/00 TIME:
DATE RECEIVED: 04/25/86 TIME: 4:00 PM
DATE COMPLETED: 05/07/86
SCHEDULED COMPLETION: 5/13/86
ANALYST: TL,TVT
QUALITY CONTROL REVIEW BY: KLM
WORKSHEET NO: 1

	#5 4'-5'	#6 6.5'-7'	#47 0'-2'	#70 0'-2'	DETECTION LIMIT	UNITS
EDI SAMPLE NO:	62026	62027	62028	62029		
TRICHLOROETHYLENE	<0.020	<0.020	15.	0.10	0.020	mg/kg
111-TRICHLOROETHANE	<0.020	<0.020	0.061	<0.020	0.020	mg/kg
TETRACHLOROETHYLENE	<0.020	<0.020	0.020	<0.020	0.020	mg/kg
DATE SAMPLED:	4/23/86	4/23/86	4/24/86	4/25/86		

ANALYSIS BY STANDARD METHODS 16TH EDITION AND/OR METHODS FOR CHEMICAL ANALYSIS OF WATER AND WASTES, USEPA, 1983.

ANALYTICAL SERVICES
EDI LABORATORY REPORT

CLIENT: GOLD SHIELD SOLVENTS
PROJECT NO.: 25690
LOCATION: GOLD SHIELD PLANT
SAMPLED BY: ELC & JLV
DESCRIPTION: SOIL QUALITY INVESTIGATION

DATE SAMPLED: 04/25/86 TIME: AM
DATE RECEIVED: 04/25/86 TIME: 4:00 PM
DATE COMPLETED: 05/07/86
SCHEDULED COMPLETION: 5/13/86
ANALYST: TL,TVT
QUALITY CONTROL REVIEW BY: KLM
WORKSHEET NO: 2

	#59 6'-7'	#61 2'-4'	#67 0'-2'	#69 4'-6'	DETECTION LIMIT	UNITS
EDI SAMPLE NO:	62030	62031	62032	62033		
TRICHLOROETHYLENE	84.	560	77.	7.1	0.020	mg/kg
111-TRICHLOROETHANE	<0.020	0.13	0.43	<0.20	0.020	mg/kg
TETRACHLOROETHYLENE	<0.020	0.24	5.4	0.47	0.020	mg/kg

ANALYSIS BY STANDARD METHODS 16TH EDITION AND/OR METHODS FOR CHEMICAL ANALYSIS OF WATER AND WASTES, USEPA, 1983.

ANALYTICAL SERVICES
EDI LABORATORY REPORT

CLIENT: GOLD SHIELD SOLVENTS
PROJECT NO.: 25690
LOCATION: GOLD SHIELD PLANT
SAMPLED BY: ELC & JLV
DESCRIPTION: SOIL QUALITY INVESTIGATION

DATE SAMPLED: 00/00/00 TIME:
DATE RECEIVED: 04/25/86 TIME: 4:00 PM
DATE COMPLETED: 05/07/86
SCHEDULED COMPLETION: 5/13/86
ANALYST: TL,TVT
QUALITY CONTROL REVIEW BY: KLM
WORKSHEET NO: 3

	#32 0'-2'	#39 0'-2'	#54 6'-7'	#72 4'-6'	DETECTION LIMIT	UNITS
EDI SAMPLE NO:	62034	62035	62036	62037		
TRICHLOROETHYLENE	370	0.091	0.14	<0.020	0.020	mg/kg
111-TRICHLOROETHANE	<0.020	<0.020	<0.020	<0.020	0.020	mg/kg
TETRACHLOROETHYLENE	<0.020	<0.020	<0.020	<0.020	0.020	mg/kg
DATE SAMPLED:	4/24/86	4/24/86	4/24/86	4/25/86		

ANALYSIS BY STANDARD METHODS 16TH EDITION AND/OR METHODS FOR CHEMICAL ANALYSIS OF WATER AND WASTES, USEPA, 1983.

ANALYTICAL SERVICES
EDI LABORATORY REPORT

CLIENT: GOLD SHIELD SOLVENTS
PROJECT NO.: 25690
LOCATION: GOLD SHIELD PLANT
SAMPLED BY: ELC & JLV
DESCRIPTION: SOIL QUALITY INVESTIGATION

DATE SAMPLED: 00/00/00 TIME:
DATE RECEIVED: 04/25/86 TIME: 4:00 PM
DATE COMPLETED: 05/07/86
SCHEDULED COMPLETION: 5/13/86
ANALYST: TL,TVT
QUALITY CONTROL REVIEW BY: KLM
WORKSHEET NO: 4

	#28 0'-2'	#46 6'-7'	#66 4'-6'	#78 4'-6'	DETECTION LIMIT	UNITS
EDI SAMPLE NO:	62038	62039	62040	62041		
TRICHLOROETHYLENE	32.	0.20	77.	<0.020	0.020	mg/kg
111-TRICHLOROETHANE	0.041	<0.020	<1.0	<0.020	0.020	mg/kg
TETRACHLOROETHYLENE	<0.020	<0.020	<1.0	<0.020	0.020	mg/kg
DATE SAMPLED:	4/24/86	4/24/86	4/25/86	4/25/86		

ANALYSIS BY STANDARD METHODS 16TH EDITION AND/OR METHODS FOR CHEMICAL ANALYSIS OF WATER AND WASTES, USEPA, 1983.

ANALYTICAL SERVICES
EDI LABORATORY REPORT

CLIENT: GOLD SHIELD SOLVENTS
PROJECT NO.: 25690
LOCATION: GOLD SHIELD PLANT
SAMPLED BY: ELC & JLV
DESCRIPTION: SOIL QUALITY INVESTIGATION

DATE SAMPLED: 04/24/86 TIME:
DATE RECEIVED: 04/25/86 TIME: 4:00 PM
DATE COMPLETED: 05/07/86
SCHEDULED COMPLETION: 5/13/86
ANALYST: TL,TVT
QUALITY CONTROL REVIEW BY: KLM
WORKSHEET NO: 5

	#17 0.5'-2.0'	#25 4'-6'	#36 0'-2'	DETECTION LIMIT	UNITS
EDI SAMPLE NO:	62042	62043	62044		
TRICHLOROETHYLENE	<0.020	<0.020	89.	0.020	mg/kg
111-TRICHLOROETHANE	<0.020	<0.020	<1.0	0.020	mg/kg
TETRACHLOROETHYLENE	<0.020	<0.020	<1.0	0.020	mg/kg

ANALYSIS BY STANDARD METHODS 16TH EDITION AND/OR METHODS FOR CHEMICAL ANALYSIS OF WATER AND WASTES, USEPA, 1983.

ATTACHMENT K3

ATTACHMENT K4

ATTACHMENT K-4

PLAN OF CLOSURE

- HAZARDOUS WASTE STORAGE TANK

- HAZARDOUS WASTE CONTAINER STORAGE AREAS

<u>TABLE OF CONTENTS</u>

LIST OF FIGURES

LIST OF TABLES

1.0 INTRODUCTION

1.1 BACKGROUND

The State of Michigan, Department of Natural Resources (MDNR), Waste Management Division (WMD), requested in a letter dated November 30, 1988, addressed to Detrex Corporation (received by Detrex Corporation on December 12, 1988), that a closure plan must be submitted (apart from the Act 64 Operating License Application) for the hazardous waste storage tanks at the Gold Shield Solvents', Grand Rapids facility. In response to the WMD's request, Detrex submitted a Plan of Closure, dated February 7, 1989, for the following hazardous waste management tanks at the Grand Rapids facility: two above ground, inactive, disconnected steel tanks.

The WMD conducted a facility visit on March 8, 1989. Based on the site visit and review of the February 7, 1989 Plan of Closure, the WMD further requested, in a letter dated May 2, 1989, addressed to Detrex, that the Plan of Closure be revised to include the closure of two inactive hazardous waste container storage areas at the facility. The May 2, 1989 letter also included a 'Notice of Deficiency' pertaining to the February 7, 1989 Plan of Closure. In response to the WMD's May 2, 1989 letter, this report presents a Plan of Closure for the following hazardous waste management units at the Grand Rapids facility:

i) two above ground, inactive, disconnected steel tanks; and
ii) two inactive waste container storage areas.

Figure 1 locates the Grand Rapids, Gold Shield Solvents' facility. Figure 2 presents a facility plan, locating the two inactive, disconnected hazardous waste tanks, and the two inactive waste container storage areas designated for closure.

Gold Shield Solvents historically recovered solvents from hazardous waste streams via distillation at the Grand Rapids facility. Hazardous wastes were received at the facility in 55-gallon drums. Upon receipt, all drums were dated, sampled and transferred to the appropriate area in the hazardous waste container storage areas to await recycling. (Note: An Act 64 Operating License Application was submitted on November 8, 1988 for the active hazardous waste container storage area).

Once the drum contents had been identified by specific gravity and/or chromatographic analysis, drums containing the same solvent (i.e. TCE) were transferred to the recycling area. The drum contents were charged individually into a batch distillation unit and the solvent content removed by heating the material with indirect steam. As the still level fell, additional waste was introduced until the still reboiler contained essentially only still bottoms. At this point, the still bottoms were heated to a pre-determined temperature to reduce the solvent content further. Subsequently, the still bottoms were transferred to accumulation tanks, located in the basement, to await final disposal off-Site.

The Gold Shield Solvents' hazardous waste recycling operation historically used generator accumulation tanks for the accumulation of still bottoms remaining at the end of the distillation process.

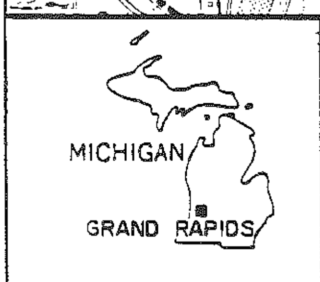


figure 1

SITE LOCATION

Detrex Corporation

Gold Shield Solvents, Grand Rapids

CRA

2471-26/01/89-7-0

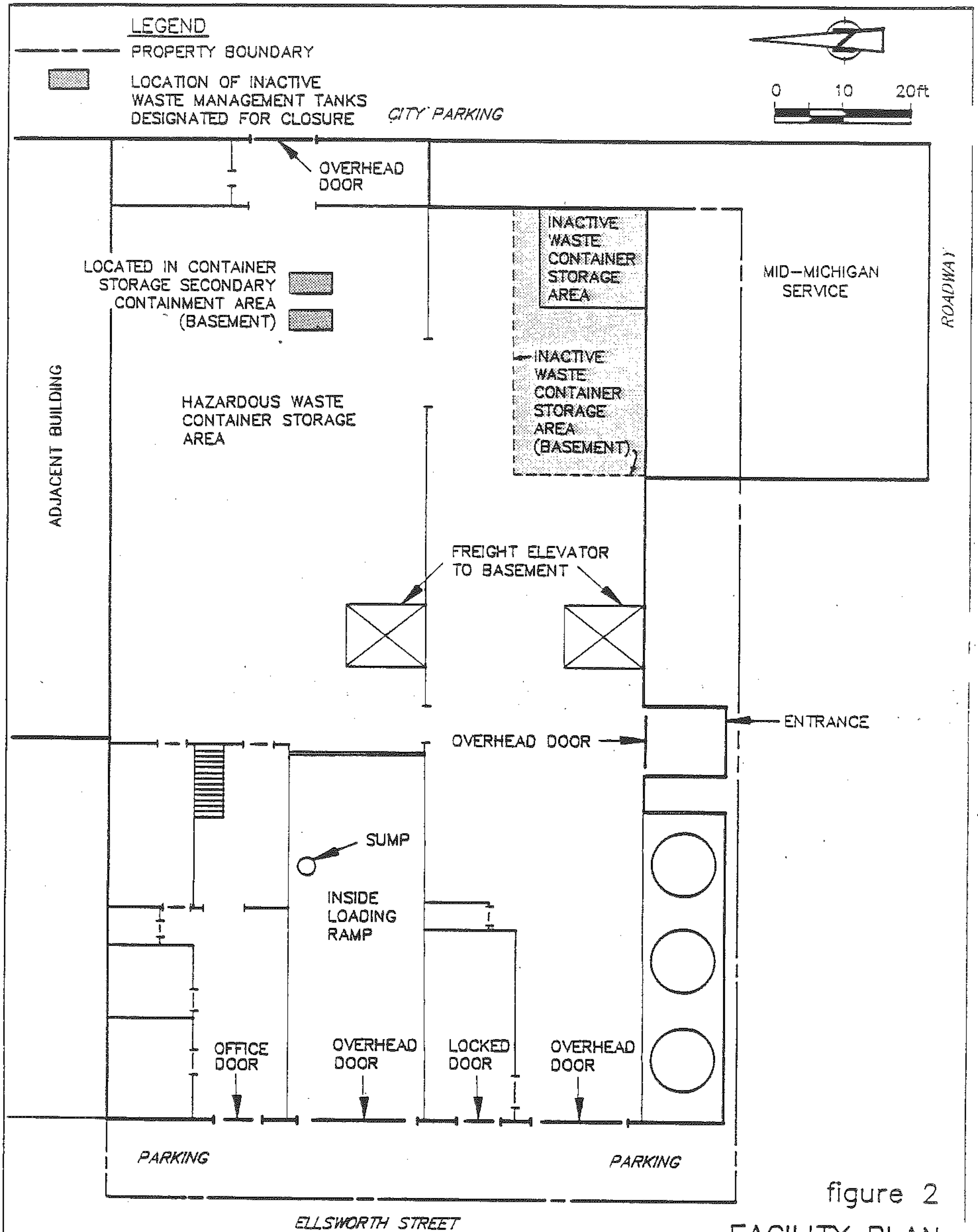


figure 2

FACILITY PLAN
Detrex Corporation
Gold Shield Solvents, Grand Rapids

CRA

2471-26/01/89-7-1

Hazardous wastes were typically stored in these tanks for less than 90 days, prior to off-site disposal/treatment. In 1987, the tank inventories were removed, piping disconnected, and the tanks cleaned.

In 1980, 1,900 gallons of design capacity for process code-S02 (tank storage) was included on Detrex Corporation's original Part A application for the Grand Rapids Gold Shield Solvents' facility. At that time, the Gold Shield Solvents' facility utilized two generator accumulation tanks (combined capacity of approximately 1,900-gallons) and Detrex mistakenly included the tank's design capacity on the original Part A application. However, based on the previously referenced letter from the MDNR, dated November 30, 1988, the WMD records indicate "...that the 'generator accumulation tanks' were included on the corporation's original Part A application and were historically used for 'accumulation' of hazardous waste for periods in excess of 90 days. Such action qualifies the 'generator accumulation tanks' as hazardous waste storage tanks." Based on the DNR's determination that the generator accumulation tanks included on the original Part A application are hazardous waste storage tanks, Detrex Corporation will close the tanks in accordance with 40 CFR § 265, Subpart G.

In 1987 Detrex consolidated all hazardous waste drum storage to the current active hazardous waste container storage area (see Figure 3). Detrex Corporation will close the two inactive hazardous waste container storage areas in accordance with 40 CFR § 265, Subpart G.

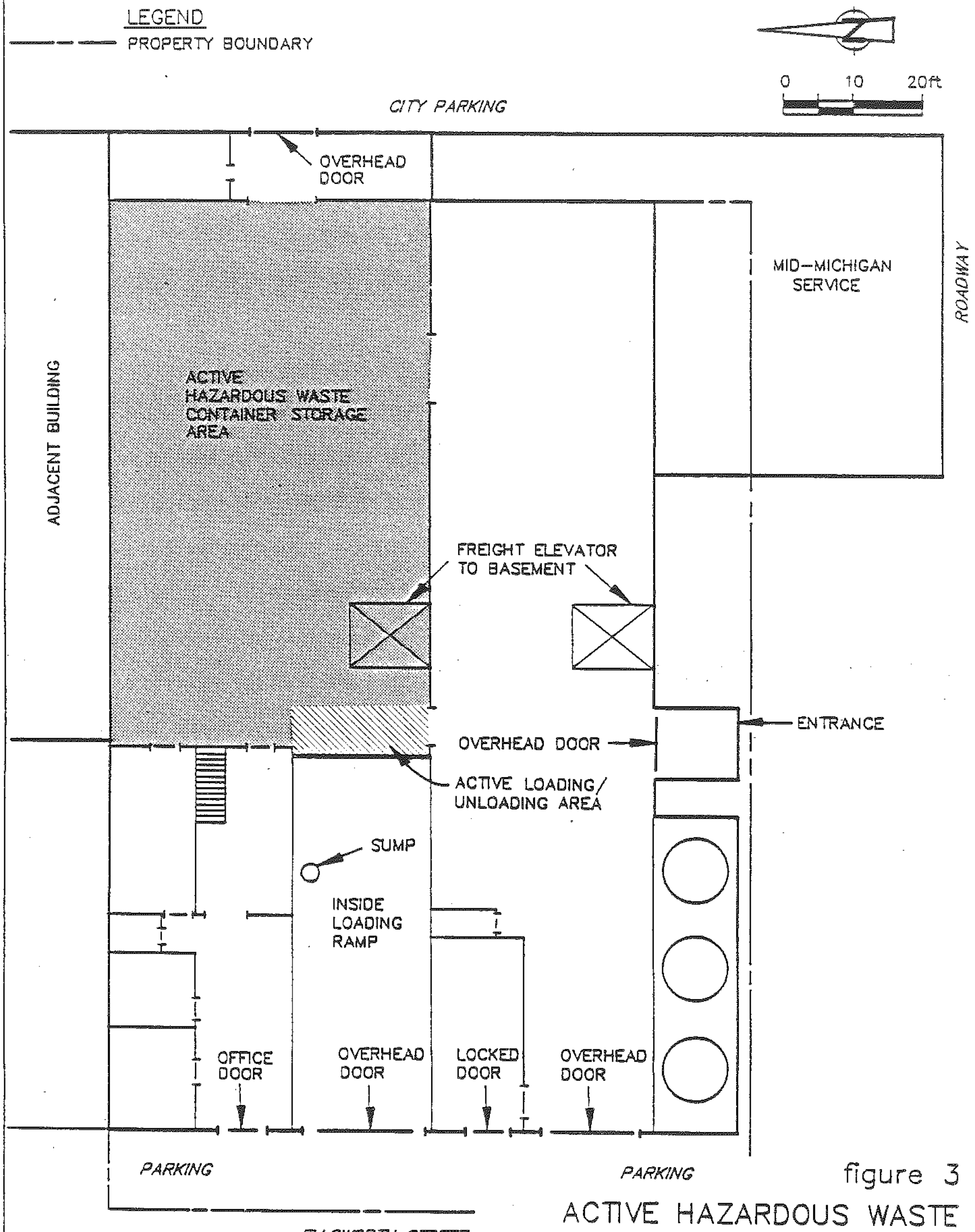


figure 3

ACTIVE HAZARDOUS WASTE CONTAINER STORAGE AREA
Detrex Corporation
Gold Shield Solvents, Grand Rapids

CRA

2471-1/06/89-7-0

1.2 CLOSURE PLAN [40 CFR § 265.112]

The closure plan for the hazardous waste tanks, and the container storage areas, designated for closure, pursuant to the requirements of 40 CFR § 265.112-265.115, is presented in Section 2.0.

The closure plan is designed to ensure that the hazardous waste management units will:

1) not require further maintenance and controls; and,

2) minimize/eliminate potential threats to human health and the environment.

Upon completion of closure activities, Detrex Corporation will submit to the Director, pursuant to the requirements of 40 CFR § 265.111, a certification by both Detrex Corporation and an independent Professional Engineer, registered in the State of Michigan, that the closure has been carried out in accordance with the approved plan.

1.3 CLOSURE COST ESTIMATE [40 CFR § 265.142]

The closure cost estimate for the hazardous waste tanks, and the container storage areas, designated for closure, pursuant to the requirements of 40 CFR § 265.142, is presented in Section 3.0.

1.4 SCHEDULE OF CLOSURE [40 CFR § 265.112, § 265.113]

The schedule of closure for the hazardous waste tanks, and the container storage areas, designated for closure, pursuant to the requirements of 40 CFR § 265.112 and § 265.113, is presented in Section 4.0.

2.0 CLOSURE OF HAZARDOUS WASTE STORAGE TANKS [40 CFR § 265.111 through § 265.115]

2.1 GENERAL

The closure of the two hazardous waste storage tanks and the two hazardous waste container storage areas, will be conducted in accordance with interim status standards 40 CFR Part 265, Subpart G.

As discussed previously, in Section 1.1, Detrex removed all tank inventory and disconnected all piping to the tanks in 1987. Also, all hazardous waste drum storage was consolidated to the current active hazardous waste container storage in 1987. Detrex is proposing to decontaminate the two hazardous waste tanks and the two hazardous waste container storage areas, under interim closure standards, and therefore, post-closure care associated with the hazardous waste units will not be required.

The following subsections describe the location and physical characteristics of each tank and the closure procedures to be adhered to.

2.2 HAZARDOUS WASTE MANAGEMENT UNIT DESCRIPTION

2.2.1 Tank Descriptions

Both tanks are open top, rectangular, carbon steel tanks and have identical capacities and dimensions. The gross capacity and dimensions of each tank is 950 gallons (effective capacity of 905 gallons) and $80\frac{1}{2}$" x 39" x 70", respectively. Figure 2, shows the location of the two tanks in the Gold Shield Solvents' facility. The tanks are located within the secondary containment system for the facility's hazardous waste container storage area.

The tanks were historically used for the accumulation of the F002 still bottom wastes listed on Table 1.

2.2.2 Container Storage Area Descriptions

Figure 2, presented previously, locates the two inactive container storage areas. Both container storage areas are located in the south east corner of facility.

The container storage area located in the basement, occupied an area of approximately 20 feet wide by 40 feet long. The basement, concrete floor slab, served as the base of the container storage area.

TABLE 1

HAZARDOUS WASTE SUMMARY

	EPA Hazardous Waste Number	*Hazardous Characteristic*
1,1,1 Trichloroethane	F001/F002	Toxic
Trichloroethylene	F001/F002	Toxic
Perchloroethylene	F001/F002	Toxic
Methylene Chloride	F001/F002	Toxic
Trichlorotrifluoroethane	F001/F002	Toxic

The container storage area located on the main floor occupied an area of approximately 16 feet square. The wood flooring of the building served as the base of the container storage area.

The basement provided for secondary containment for both inactive hazardous waste container storage areas.

Both container storage areas were historically used to store the F001 and/or F002 wastes listed on Table 1.

2.3 CLOSURE PROCEDURE [40 CFR § 265.112]

Closure of the two hazardous waste tanks and the two hazardous waste container storage areas will be carried out in accordance with the following procedures.

Any remaining tank sludges and tank scale, will be hand shovelled into DOT approved 55-gallon drums for ultimate transportation off site to a permitted treatment or disposal facility.

Following removal of any remaining sludges and tank scale from each of the tanks designated for closure, Detrex will decontaminate the interior of each tank. The decontamination protocol to be followed by Detrex is summarized as follows:

a) Solvent rinse the interior of each tank with 1,1,1-Trichloroethane, and allow to air dry for 15 minutes; and

b) Steam clean the interior of each tank, repeat three times and allow to air dry for 24 hours after final rinse.

Prior to commencing tank decontamination, plastic sheeting will be placed beneath each tank. The solvent rinse and wash water will be collected from the tanks using 5-gallon pails or equivalent. The plastic sheeting will collect any solvent rinse and wash water not contained within and collected from the tank.

Following decontamination, the hazardous waste storage tanks designated for closure, may be dismantled and disposed of as non-hazardous scrap. The dismantling and disposal of the tanks is, therefore, not included under the closure cost estimate or closure schedule.

All equipment used during tank decontamination will be steam cleaned over the plastic sheeting.

All solvent rinses and wash water generated will be placed into 55 gallon DOT-approved drums for ultimate transportation off site to a permitted treatment or disposal facility. All wastes, based on Detrex's previous recycling operation, will be classified as F002 wastes.

Upon completion of the decontamination procedures of each tank and equipment, the floor area of the entire basement (north and south halves) will be swept. All sweepings will be placed into DOT-approved 55-gallon drums for ultimate transportation off site to a permitted treatment or disposal facility. All sweepings, based on Detrex's previous recycling and storage activities, will be classified as F002 wastes.

Subsequent to sweeping, the entire basement floor and portions of the walls (3 feet above the floor) will be washed with a high pressure detergent spray and triple rinsed with a steam cleaner. The wash water generated will be collected in the elevator pit between the north and south halves of the basement. Collected wash water will be pumped into DOT-approved 55-gallon drums for ultimate transportation off site to a permitted treatment or disposal facility. All wash waters, based on Detrex's previous recycling and storage activities, will be classified as F002 wastes.

The wood flooring of the 16 square foot area, in the southeast corner of the main floor, will be removed and placed in DOT-approved containers (drums and/or lugger boxes) for transportation to a permitted disposal facility. All wood flooring, based on Detrex's previous recycling and storage activities, will be classified as F002 wastes.

All waste shipments will be manifested in accordance with 40 CFR Part 265, Subpart E and accompanied by notification required under 40 CFR § 268.17.

2.4 SOIL SAMPLING

The MDNR requested, in a letter dated July 25, 1988, addressed to Detrex, that Detrex develop a work plan to identify the extent of soil contamination at the Gold Shield Solvents' facility. On September 26, 1988, Detrex submitted a work plan entitled "Work Plan - Site Investigation - Gold Shield Solvents - Grand Rapids, Michigan, September 23, 1988" to the MDNR. The objectives of the Work Plan was to investigate the extent and degree of potential soil contamination resulting from past storage and handling activities at the facility. The Work Plan was reviewed and approved by the MDNR. The Work Plan is enclosed as Appendix A.

The MDNR approved Work Plan proposed eleven soil boring locations adjacent to and beneath the building facility. Two additional soil borings were added to the program during sampling activities, in order to attempt to define the aerial extent of soil contamination. In total, thirteen boreholes were completed at the site, including three boreholes in the basement of the building. Three soil samples from each boring completed on site were selected and analyzed for volatile organic compounds (VOCs) and total petroleum hydrocarbons (TPH). The VOCs were analyzed following SW846 Method 8010/8020 and the TPH were analyzed using SW846 Method 8015 (modified).

The results of the Site Investigation were presented to the MDNR in a report entitled "Final Report - Site Investigation, Gold Shield Solvents, Grand Rapids, Michigan, March 30, 1989". The Final Report is enclosed as Appendix B.

The Final Report identifies that a continuous fine grained clay unit is present beneath the facility. The continuity of the clay unit was subsequently confirmed during a hydrogeologic investigation conducted at the facility during May 1989. The results of the hydrogeologic investigation will be submitted to the MDNR by June 19, 1989 in support of an operating license application. The site investigation and the hydrogeologic investigation identified fill material above the clay unit. Neither investigation identified groundwater above the clay unit. The hydraulic conductivity of the clay is currently being determined as part of the hydrogeologic investigation. The hydraulic conductivities are, however, expected to be equal to or less than 1×10^{-7} cm/sec.

Of the nine soil samples collected from the three locations beneath the building, only one at a depth of 1.0 to 2.0 feet below the floor slab, was found to have detectable concentrations of trichloroethylene (310 mg/kg). The remaining eight soil samples did not have any detectable concentrations of VOCs. The soil sample, in which trichloroethylene was detected, was collected from a borehole completed in the vicinity of the two inactive storage tanks. The Final Report concludes that with the exception of the isolated area beneath the northeast corner of the building, the past site operations have not impacted the overburden soil beneath the building.

As stated previously, the Final Report has been submitted to the MDNR for their review. Detrex has not received, at this time, any comments from the MDNR pertaining to the Final Report. Since the Work Plan was reviewed and approved by the MDNR and the objective of the soil sampling, outlined in the Work Plan and discussed in the Final Report, was to investigate the extent and degree of potential soil contamination, Detrex is of the opinion that further soil sampling is not required. Remediation, if any, of contaminated soils identified in the Final Report, will be addressed by Detrex, subsequent to receipt of comments, pertaining to the Final Report, from the MDNR.

2.5 CLOSURE CERTIFICATION [40 CFR § 265.115]

Within 60 days of completing closure activities, Detrex Corporation will submit to the Director, certification, in the language provided in 40 CFR §270.11(d), by both Detrex Corporation and an independent Professional Engineer, registered in the State of Michigan, that the closure activities were conducted in accordance with the approved plan.

The closure certification document shall include, but not be limited to:

1. Manifests of where and how much waste was shipped;

2. Certification statement by Detrex Corporation and an independent Professional Engineer, registered in the State of Michigan.

3. Summary of decontamination procedures (solvent rinse, pressure wash, steam clean, etc.) and how rinses and waste water were disposed;

4. Results of all tests used to verify decontamination; and

6. Sampling and analysis procedures.

3.0 CLOSURE COST ESTIMATE [40 CFR § 264.142]

The total closure cost for the closure of the Detrex Corporation, Gold Shield Solvents' facility two inactive hazardous waste tanks and two inactive hazardous waste container storage areas is estimated at $44,600.00 (1989 dollars). Table 2 provides a closure cost estimate. Activities include removal of tank sludge and scale, decontamination, off-site treatment or disposal of all wastes, and closure certification.

The cost estimate assumptions made are:

1) Labor costs are presented at $25.00 per hour to account for labor costs and $30.00 per hour for supervisors. All labor rates reflect commercial rates and include fringe benefits, payroll burden and taxes.

2) Total costs include a 15% contingency for administrative and 20% contingency for miscellaneous operating costs.

TABLE 2

CLOSURE COST ESTIMATE

ITEM	*ACTIVITY*	*ESTIMATED COST*
1.	Remove, collect and drum tank sludge and scale	
	a) Labor: 1 man day @ $200/day	$200.00
	b) Supervision: 1/2 man day @ $240/day	120.00
	c) Equipment to move drummed waste to facility container storage area @ $400/day	200.00
	Sub-Total 1	$520.00
2.	Transport and off-site disposal/treatment of drummed tank sludges at a permitted facility @ $550/drum	$1,100.00
	Sub-Total 2	$1,100.00
3.	Decontaminate tanks	
	a) Labor: 2 man days @ $200/day	$400.00
	b) Supervision: 1 man day @ $240/day	240.00
	c) Equipment for decontamination and miscellaneous material handling @ $400/day	800.00
	d) Transport and off-site disposal/treatment of tank rinses: 4 drums @ $550/drum	$2,200.00
	Sub-Total 3	$3,640.00
4.	Decontaminate secondary containment area, inactive container storage areas and equipment	
	a) Labor: 6 man days @ $200/day	$1,200.00
	b) Supervision: 3 man day @ $240/day	720.00
	c) Equipment for decontamination, removal of wood flooring and miscellaneous material handling @ $400/day	1,200.00
	d) Transport and off-site disposal/treatment of sweepings, washings and wood flooring: 33 drums @ $550/drum	$18,150.00
	Sub-Total 4	$21,270.00

TABLE 2

CLOSURE COST ESTIMATE

ITEM	*ACTIVITY*	*ESTIMATED COST*
5.	Closure Certification	
	a) Professional Engineer to review final closure plans, inspect closure activities and certify closure @ $500/day	$5,000.00
	b) Disbursements including office expenses and travel expenses	1,500.00
	Sub-Total 5	$6,500.00
	Sub-Total 1, 2, 3, 4 & 5	$33,030.00
	Administration (15%)	4,960.00
	Contingency (20%)	6,610.00
	Total Estimated Final Closure Cost	$44,600.00

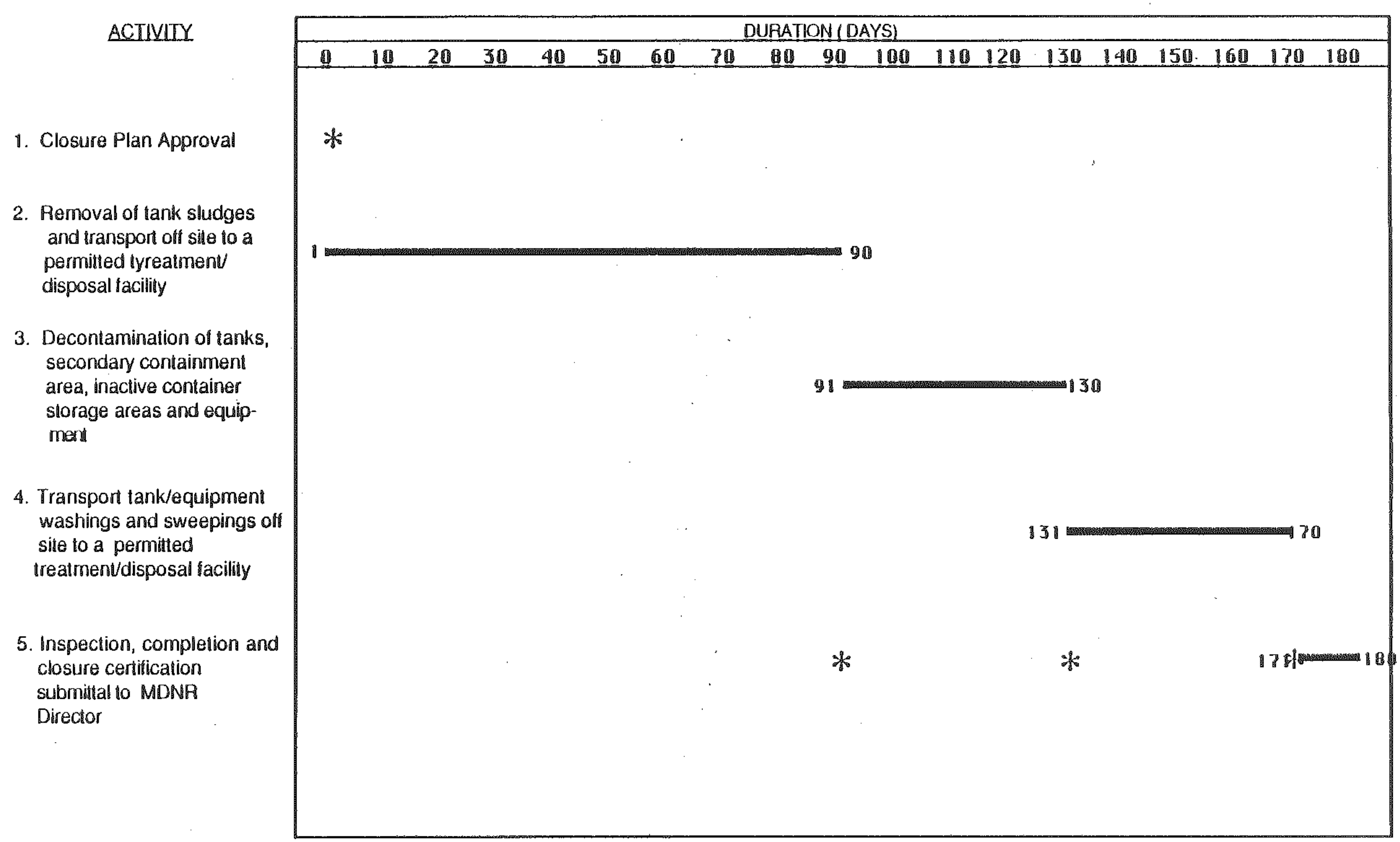
Notes:
1) Waste inventory has already been removed from the tanks.
2) Sludge volume estimated @ 5% of tank volume.
3) Tank rinses volumes estimated @ 10% fo tank volume.
4) Sweepings estimated @ 3 drums.
5) Basement washing volumes estimated @ 3 gallon/min for 8 hrs. = 1440 gal/day = 26 drums.
6) Wood flooring estimated @ 4 drums.
7) All costs presented in 1989 dollars.

4.0 CLOSURE SCHEDULE [40 CFR § 265.112, 265.113]

Within 90 days after receipt of final approval of the closure plan, Detrex Corporation will transport off site all tank sludges, and within 180 days after receipt of final approval of the closure plan, Detrex Corporation will complete all closure activities in accordance with the approved plan.

Also, five days prior to closure activities, the WMD Grand Rapids office and WMD Lansing Permit office will be notified.

The proposed closure schedule for tank closure activities is presented on Figure 4.



LEGEND

ACTIVITY DURATION

* EVENT / INSPECTION

figure 4
PROPOSED TANK CLOSURE SCHEDULE
Detrex Corporation
Gold Shield Solvents, Grand Rapids

CRA

2471- 01/27/89-7-D-0

All of Which is Respectfully Submitted,

CONESTOGA-ROVERS & ASSOCIATES

Ed Roberts, P. Eng.

All of Which is Respectfully Submitted,

CONESTOGA-ROVERS & ASSOCIATES

Ed Roberts, P. Eng.

L

SECTION L

OTHER FEDERAL LAWS

SECTION L

OTHER FEDERAL LAWS

Information will be provided in accordance with the requirements for 40 CFR Part 270.14(b) (20) at the request of the EPA Region or the MDNR. At this time, however, we believe this facility is in compliance with the following Federal Laws; Wild and Scenic Rivers Act, National Historic Preservation Act of 1966, Endangered Species Act, Coastal Zone Management Act, and the Fish and Wildlife Coordination Act.

M

SECTION M

CERTIFICATION

CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibliity of fine and imprisonment for knowing violations.

Signature Robert Jones
Name R.J. Jones
Title Vice-President
Date 11-4-88